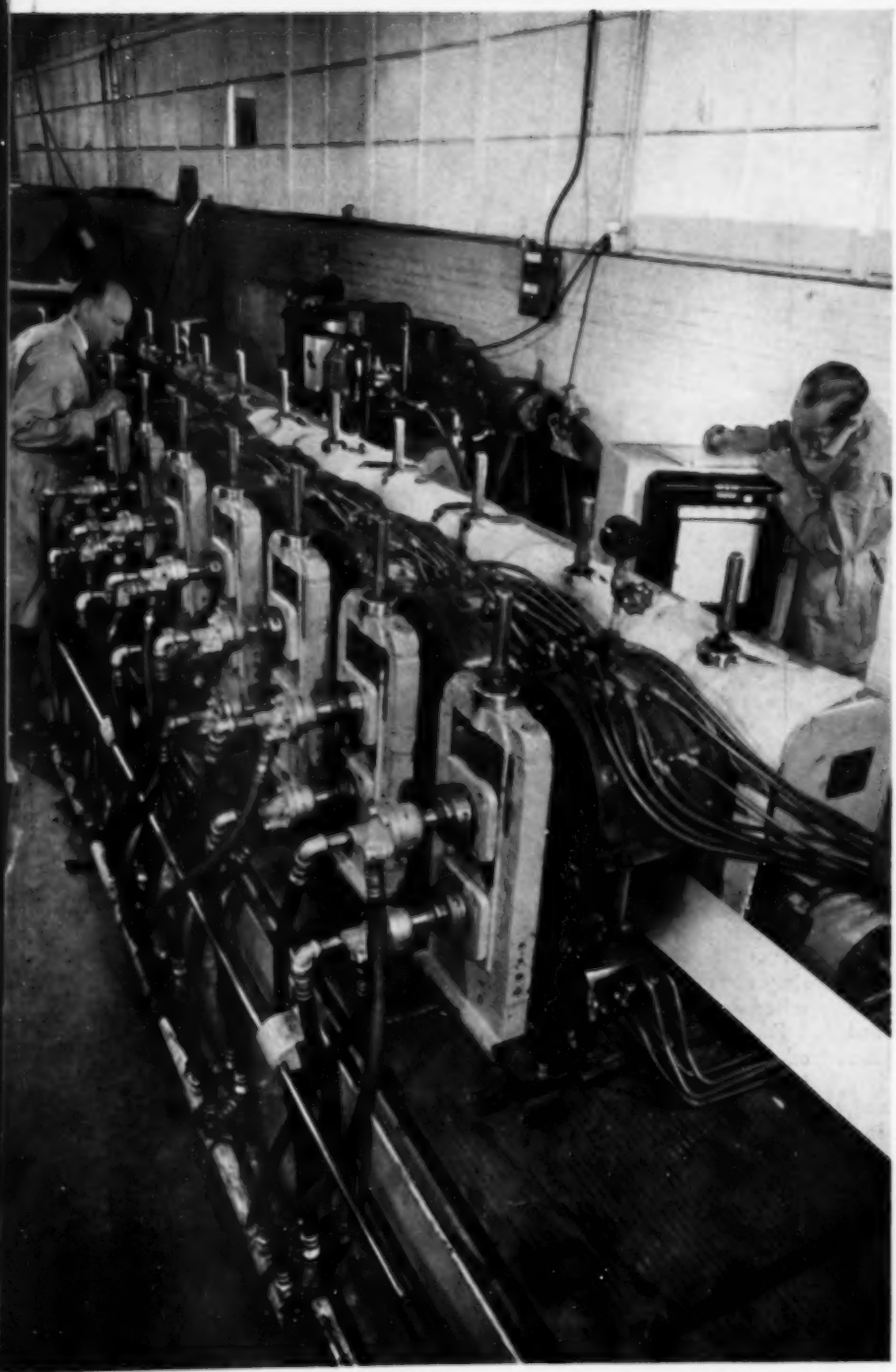
American Machinist

FEBRUARY 24, 1958 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Practical Cost Reduction

A SPECIAL REPORT, page 113



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8-minute cycle for frozen clamping, page 102

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Contact tracing on graphite, page 112

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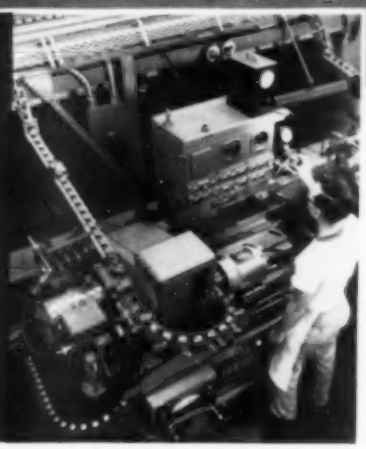
Furnace "cap" to hot-roll titanium—see page

Over 70 Heald Internals precision grind

60 MILLION

Bearing Races a Year at The Timken Company's "AUTOMATIC FACTORY"



These two rows of Heald Model 190 Centri-Matics, on lines four and five of the Cone Finishing Department at Bucyrus, grind bearing cone bores to a tolerance of .0005. Cycle time ranges from 14 to 25 seconds, depending on size and stock removal.

Close-up view of one of the 29 Model 190 Centri-Matics showing conveyorized workhandling equipment. The parts come to the inclined loading chutes from the conveyor belt at top left. As the cones leave the machine through the unloading chute they are demagnetized. The sizing gage on top of machine permits quick checking of tolerances.

From raw tube stock to precision-finished bearing races, untouched by human hands! This—the ultimate in automation—has been successfully achieved at the Bucyrus, Ohio, plant of The Timken Roller Bearing Company. Here, a total of 60 million cups and cones a year are rolling off of America's most fully automated production lines. Sixty million individual bearing races—formed, heat treated, machined and sized in one continuous, fully automatic cycle.

The I.D.s of all races are finish ground on Heald Centerless Internals—43 No. 10 machines for tapered bores of outer races and 29 Model 190 Centri-Matics for straight bores of inner races. These are *standard machines*, fully automatic in loading, cycling and unloading. Hence they were integrated into the automated production line simply by the application of suitable conveyorized workhandling equipment.

For complete information on these or any other internal or rotary surface grinders, just get in touch with your Heald engineer.

HEALD

IT PAYS TO COME TO HEALD!

THE HEALD MACHINE COMPANY

Subsidiary of The Cincinnati Milling Machine Co.

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McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

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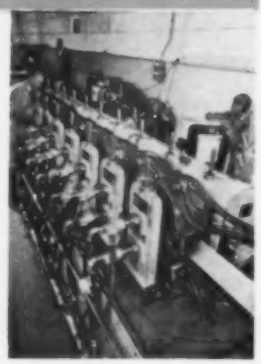
American Machinist chips



Cost reduction . . . A subject which everybody is in favor of, especially now, but one about which it seems there is always room for improvement. When we heard about a program operated and controlled by two men, and which had produced actual savings of more than $9 million in less than three years, we felt that it was a program bound to give you ideas you could apply in your own plant. Associate Editor John Wright uncovered the program at Republic Aviation and quickly sold us.

Cost reduction is an everyday affair with all production men, but here is a practical supplementary program with proof that it pays off in handsome fashion. Working with N W Andrews and A W Dover, the two men responsible for the program, John has produced an account of how it operates that is liberally spiced with examples of the cost-saving ideas it produced. You'll find it all in the Special Report starting on page 113.

The need to know . . . In this satellite age, you need to know more about the developments that will affect you. Yet you have less time than ever to devote to the search. Our aim has always been to aid you in that search, to give the production man the fullest, most valuable reporting of what he needs to know that can possibly be packed between the covers of a magazine. As one part of this effort, we ask the advice and opinion of a number of readers on every issue. In the past dozen years we have approached more than 60,000 readers with these questions. If we haven't happened to hit you, don't wait. Drop us a line and tell us what you want *American Machinist* to do.

Another Aid . . . If you save your copies of *AM*, you'll find the annual index a handy reference to locate that article you remember vaguely. The index for 1957 is now ready, and will be sent free to any subscriber on request.

Coming . . . *AM* for March 10 holds several surprises. One is a special study on where metalworking production is headed in the next two or three years. Another is a cover that will present graphically the key problem to hypersonic flight and an article that will show how production men can handle the solution. You'll find a new approach to tap procurement, some ideas on carbide dies, a case where stainless is lighter than aluminum, and the next installment in Spence Tucker's series on small shop management.

Cover . . .

Titanium is rolled at Boeing on Yoder equipment. The trick is in the special gas-fired furnaces and details are in the article on page 111.

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Helixform*—a new method for bevel gear production!

The new No. 112 Hypoid Helixform Gear Finisher assures improved quality and increased production on spiral bevel and hypoid non-generated ring gears up to 10½" in diameter, and 2½ DP such as employed in passenger car axles.

The Helixform Cutting Method used on this machine offers these advantages:

Conjugate tooth surfaces, minimized gear development, complete control of tooth bearing, and greater adjustability in final assembly.

We will be glad to send a bulletin giving further details on request. Ask for literature on the No. 112 Hypoid Helixform Gear Finisher and the companion No. 112 Hypoid Gear Rougher. Write for it today.

*Trade-Mark

GLEASON WORKS

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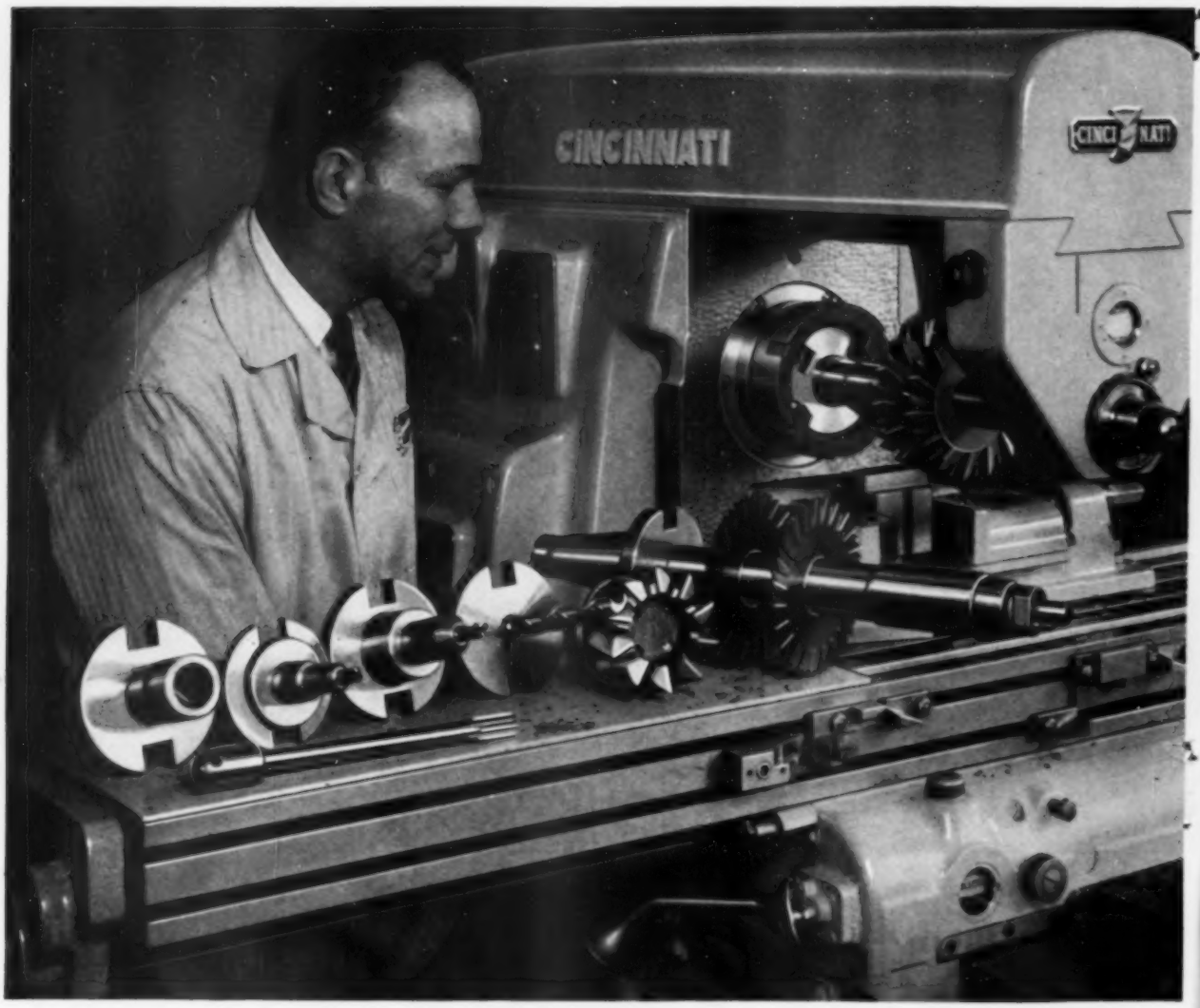
ARBOR-LOC®

CINCINNATI'S NEWEST FEATURE



ARBOR-LOC is a big timesaver in interchanging the seven cutting tools on the table of the CINCINNATI Dial Type Milling Machine illustrated here.

CINCINNATI®

MILLING MACHINES • BROACHING MACHINES • CUTTER
METAL FORMING MACHINES • HARDENING MACHINES •

Reduces Setup Time

Standard Cincinnati Arbors interchanged *in seconds!*

Saving time and money in multiple operation milling is simple with the new ARBOR-LOC formula: multiply a minute or more x tool changes x pieces per lot. ARBOR-LOC is a new cost-reducing feature incorporated in *most CINCINNATI knee-and-column milling machines. It gives the operator an opportunity to quickly and safely change cutters and arbors as often as required. Just picture these ARBOR-LOC advantages for your own shop:

- **Increases productivity of the machine for short runs. Arbors can be changed in a few seconds' time.**
- **No need for special-purpose quick-change accessories for multiple operations. ARBOR-LOC accommodates Cincinnati's complete new line of standard No. 50 flanged arbors and adapters.**
- **Simplifies tooling problems through more complete standardization of arbors and similar accessories.**
- **Quickly assembled and removed for setups where not required, such as for face milling cutters.**
- **Does not restrict use of existing arbors, adapters, etc.**

CINCINNATI

*The following CINCINNATI knee-and-column milling machines are equipped with ARBOR-LOC spindle nose: Nos. 2ML; 2 and 3MI; 2, 3 and 4 Dial Type; 2 and 3 High Power Dial Type; 2 and 3 Dual Power Dial Type; plain, universal and vertical styles. You may obtain more information by writing for publication No. M-2016.

AND TOOL GRINDERS • SPECIAL MACHINE TOOLS
CUTTING FLUIDS • GRINDING WHEELS

THE CINCINNATI MILLING MACHINE CO.
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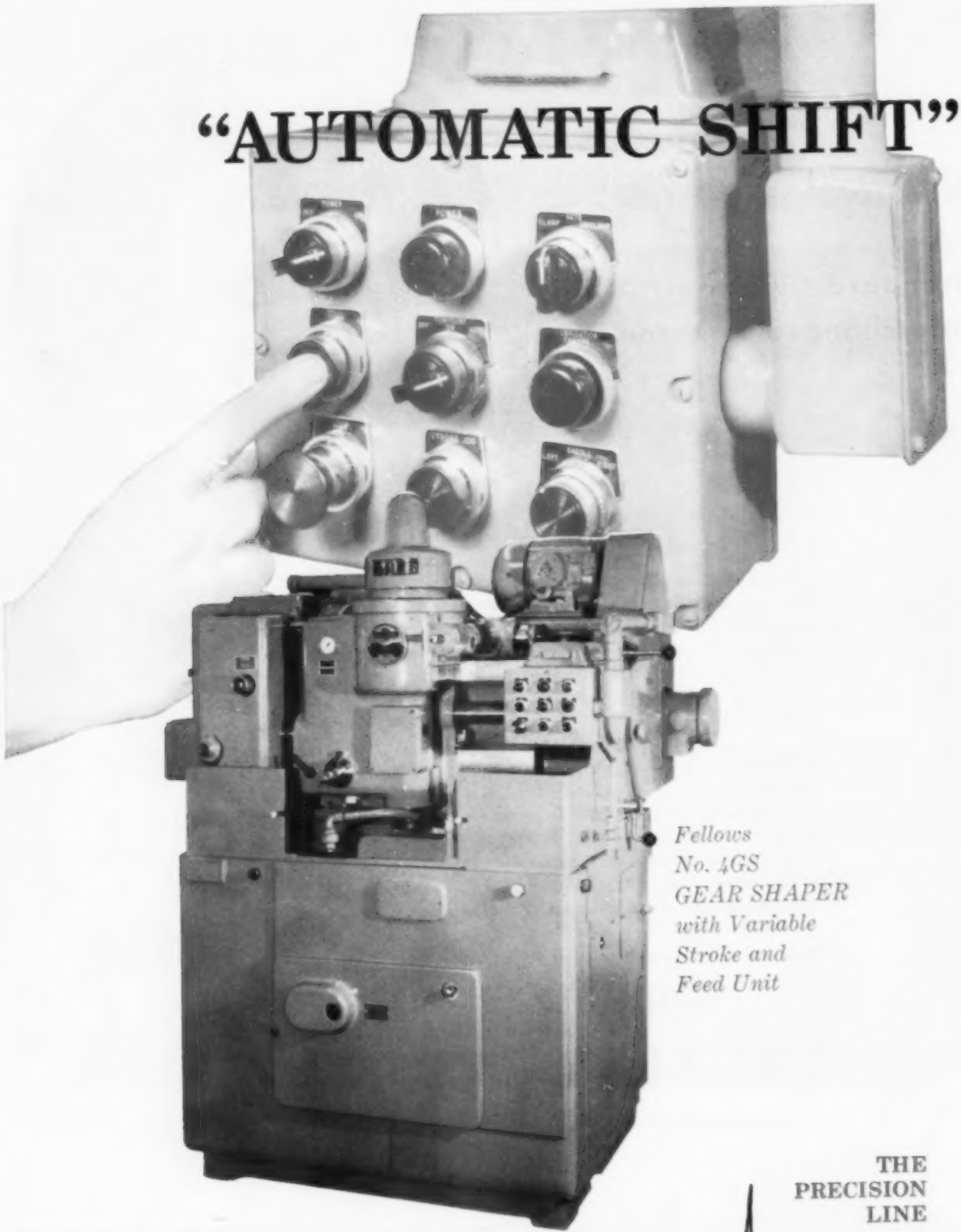
"AUTOMATIC SHIFT"



Fellows
No. 4GS
GEAR SHAPER
with Variable
Stroke and
Feed Unit

THE PRECISION LINE

changes Stroke and Feed

✓ Cuts production time...
✓ Lowers overall costs

Now... you can lower overall costs by using the Fellows No. 4GS Gear Shaper with the new, optional Variable Stroke and Feed Unit which *automatically* changes the rate of stroke and rotary feed between first and second cuts at any selected ratio within the speed and feed ranges of the machine.

With the Variable Stroke and Feed Unit the No. 4GS can make two cuts, and give you two-cut quality, in approximately the same time required for a single cut. There is no need to compromise on cutting speeds or feeds. Roughing and finishing cuts can be made at rates which are optimum for cutter and material.

Cutter wear is minimized, and finish is improved, because you can select and use the best combination of strokes per minute and feed per stroke of the cutter for each cut. Once the selector switches and gear ratios have been set, changes in speed and feed occur automatically during the cutting cycle.

The Variable Stroke and Feed Unit is available as an optional unit on all Fellows No. 4GS Gear Shapers. The selector switches for this unit can be set to operate the machine as a standard Gear Shaper; to change *either* the strokes per minute *or* the rotary feed for the finish cut; or, to change *both* stroke and feed for the finish cut.

The No. 4GS provides nine cutter speeds ranging from 98 to 635 strokes per minute and rotary feeds ranging from 0.008" to 0.028" per stroke, based on a 4-inch pitch diameter cutter. Set-ups are easy and fast for internal or external, spur or helical gears, as well as cams, splines and other non-involute shapes up to 6" pitch diameter and 2" face width.

For full information, get in touch with your nearest Fellows representative. If you would like to have a 72-page booklet describing the Fellows No. 4GS Gear Shaper and its operation, just write to any Fellows office.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Michigan
150 West Pleasant Ave., Maywood, New Jersey
5835 West North Ave., Chicago 39, Illinois
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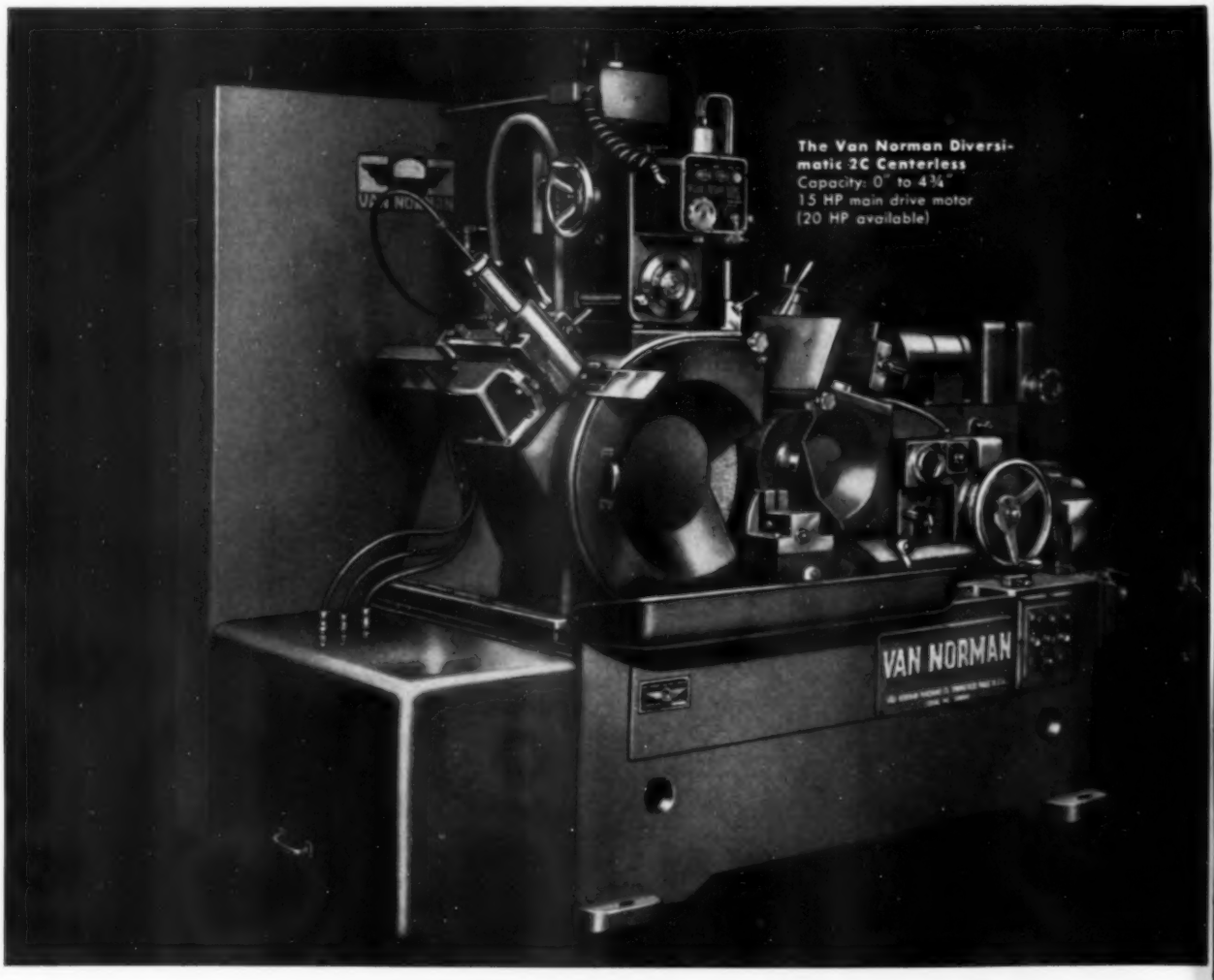
Fellows *Gear Production Equipment*

Now you can volume-produce a wide new range of close-tolerance parts with

VAN NORMAN'S

crush-former equipped

DIVERSIMATIC*



The Van Norman Diversi-matic 2C Centerless
Capacity: 0" to 4¾"
15 HP main drive motor
(20 HP available)

VAN NORMAN MACHINE

A Division of VAN NORMAN INDUSTRIES, INC.

MANUFACTURERS OF — Ram and Column Type Milling Machines, Cylindrical Grinders, Spline and Gear Grinders, Oscillating Radius Grinders, Special Production Grinders, Centerless Grinders.

These are a few typical parts produced by a Van Norman Diversimatic 2C Centerless equipped with crush form attachment.

With Van Norman's Diversimatic Centerless and crush form attachment, you can now crush form a grinding wheel to intricate shapes and volume-produce many parts previously impossible by any other method.

Typical of the many high-speed, close-tolerance operations now being performed with the Van Norman crush form attachment is the crush form ground part shown here. A crush formed wheel grinds the O.D. and ball race simultaneously, holding .005 radius on the corner of the ball race, .001 tolerance on race curvature and .0005 tolerance on the O.D. and diameter of the ball race, with 10-12 RMS finish.

This part is ground in two passes of 12 seconds each, removing .012 on the first and .002 on the second, insuring concentricity of the O.D. and ball race. The Diversimatic Centerless finishes five of these parts per minute, 300 per hour.

Get complete details on the Van Norman Diversimatic Centerless with crush form attachment. Write, wire or phone now for descriptive catalogs.

*T.M. Reg. U. S. Pat. Off.

With the Van Norman Diversimatic equipped with crush former:

- Wheel forms can be maintained to extremely close tolerances.
- Many more parts can be ground per dress — up to 10 times as many as by a diamond dress.
- Finer grain wheels are used in crush forming — resulting in a faster grinding cycle because a larger portion of sharp cutting edges are exposed to the work.
- Greater wheel economy is realized through the larger number of parts per dress.

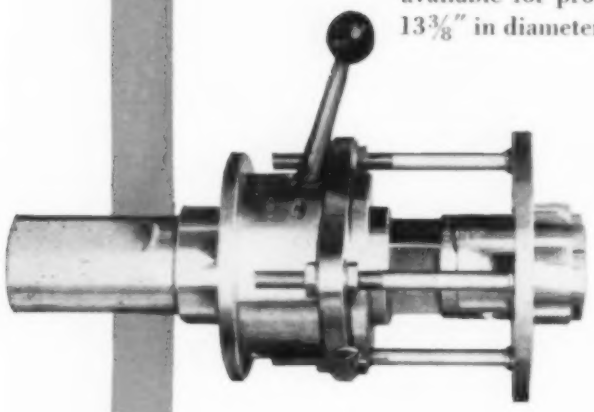
COMPANY
SPRINGFIELD 7, MASSACHUSETTS

Don't wait . . . for increased production and reduced costs install a Van Norman now! They're available on many purchase plans . . . outright sale . . . purchase on conditional sales contract up to five years . . . pay as you depreciate . . . up to 10 years.

LANDIS Collapsible Taps

Sensitive Collapsing Action

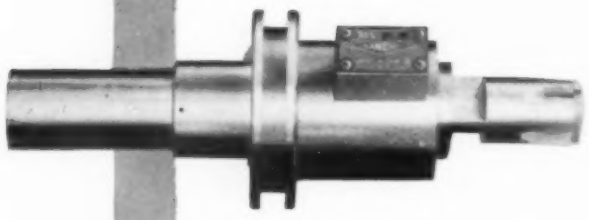
The design of LANDIS Collapsible Taps reduces tool wear, "torn" threads and tapping time by permitting direct removal from the workpiece without reversing or "backing out". The sensitivity of this "collapsing action", which automatically withdraws the chasers from the completed thread, assures uniform thread lengths and threading to a shoulder with safety. Various sizes of LANDIS Taps are available for producing straight or tapered threads from $1\frac{1}{4}$" to $13\frac{3}{8}$" in diameter.



Stationary Tap

ALT TAPS for straight threads

These taps feature a rugged construction and design simplicity which enable maximum chaser rigidity. The same tap may be used for either stationary (shown) or rotary application. Tapered threads can be tapped using chasers cutting across their entire width.



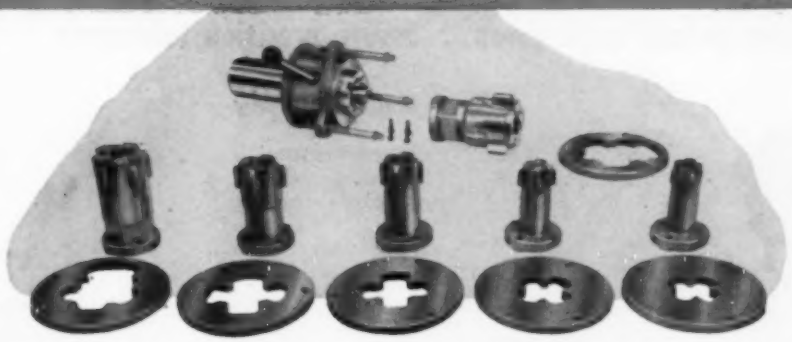
The Rotary Tap

LL TAPS for tapered threads

The thread taper is produced by mechanical receding action of the chasers during threading. This action reduces cutting strains by restricting cutting action to the chaser throat or chamfer section. As little or no "cold working" can result, LL Taps are ideally suited for tapping tapered threads in stainless steel. These taps will also produce straight threads, and are available for either stationary or rotary applications.

Sensitive Collapsing Action

Straight or Tapered Threads Rotary or Stationary Use

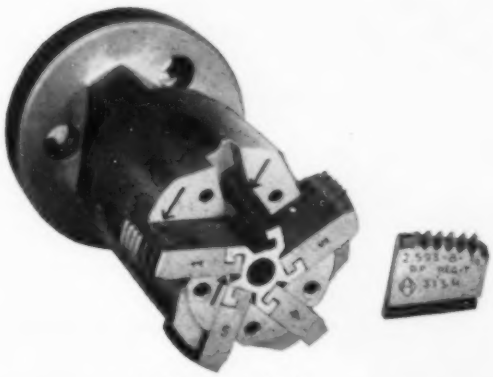


Wide Range Coverage

Detachable heads are a feature of all LANDIS Collapsible taps. This design allows tapping a wide range of thread diameters with minimum tooling—for example, the 3ALT body using 6 different heads will tap all diameters from 1¼" to 3¼". Each tap head itself has a wide threading range—the 1½" head will thread from 1⅜" to 1⅝", the 2" from 1⅞" to 2-5/16", the 3" from 2¾" to 3¼".

Maximum Rigidity

The basic design of all LANDIS Tap Heads assures maximum bearing support between the chaser, plunger and tap head body. In the cross-section illustration, note the heavy metal sections which provide rigidity to the chasers and plunger, particularly at the points where cutting strains are transmitted.



Size Adjustment Ease

All LANDIS Taps are designed so that they may be quickly adjusted approximately 1/32" over or under the nominal chaser size. The ratchet-type size-adjusting screw is conveniently located in the front of the tap. The movement of one ratchet tooth provides a self-locking diametrical adjustment of .001".

LANDIS *Machine* COMPANY

WAYNESBORO • PENNSYLVANIA • U. S. A.

430-C THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT - CUTTING - TAPPING - GRINDING - ROLLING

Straight or Tapered Threads Rotary or Stationary Use

Low cost Landis Grindwell gives

...exclusive features permit quick setup... assure precision tolerances

for: manufacturing / maintenance / toolroom grinding

Landis 12" x 28" Grindwell

LANDIS

precision grinders

LANDIS TOOL COMPANY

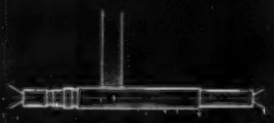
"big grinder" performance

Exclusive Feature: Variable speed headstock . . . compact design with only two revolving parts. Can be swiveled for angle or face grinding.

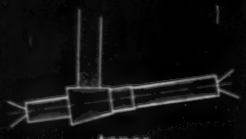
Exclusive Feature: Microsphere bearings . . . close running clearance of Landis Microsphere bearings gives faster spark-out, accurate, quick response to wheel feed.

WAYNESBORO, PENNSYLVANIA

typical grinding operations

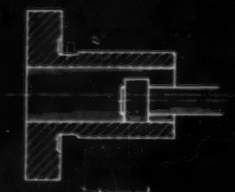


straight cylindrical



taper

face and angle



internal

Handle more jobs at

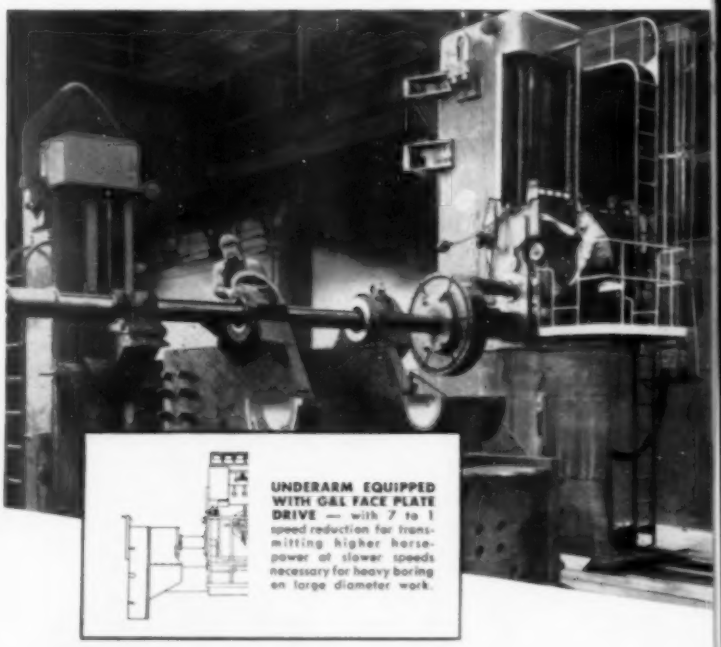
Giddings & Lewis Floor-Type Horizontals with the underarm support offer remarkable versatility — perform a wide variety of highly accurate work in many planes — eliminate costly individual setups!

These amazingly versatile underarm machines make possible and profitable handling of unusually large work at increased production rates. In combination with the world's broadest line of horizontal boring machine attachments and accessories (see photos at right) you enjoy greater machine capacity, practically unlimited machining flexibility!

The heavy-duty underarm allows milling, facing, boring and many other operations in planes and at distances from the headstock not possible with conventional attachments. Power feeds to the underarm are the same as the spindle feeds. Declutching permits you to feed spindle independently of underarm which withdraws flush with face of headstock when not in use.

In addition, you get individual feed motors for both the column and the headstock — full, smooth, continuous power for every operation.

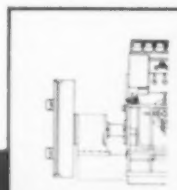
The optional underarm support is offered on G&L Floor-Type and Planer-Type machines. G&L Floor-Type Horizontal boring, drilling and milling machines with the versatile underarm are available in 10 models, 4 different design series, 5-14" dia. spindles, 30-150 hp. For details, see your nearest G&L representative or write direct.



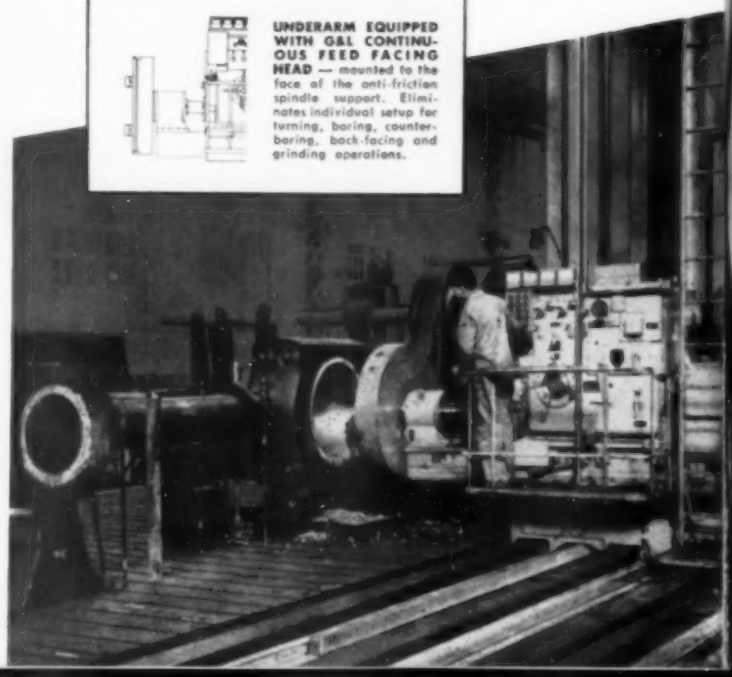
UNDERARM EQUIPPED WITH G&L FACE PLATE DRIVE — with 7 to 1 speed reduction for transmitting higher horsepower at slower speeds necessary for heavy boring on large diameter work.

with G&L underarm

Gives table-type versatility to



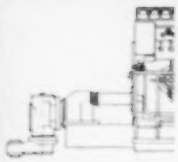
UNDERARM EQUIPPED WITH G&L CONTINUOUS FEED FACING HEAD — mounted to the face of the anti-friction spindle support. Eliminates individual setup for turning, boring, counterboring, back-facing and grinding operations.



G & L and HYPRO DIVISION
GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN G-89

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; HYPRO Double Housing and Openside Planers; Planer-Type Milling Machines; Vertical Boring Mills; Spar and Skin Milling Machines, and VARIAX Profile Milling Machines.

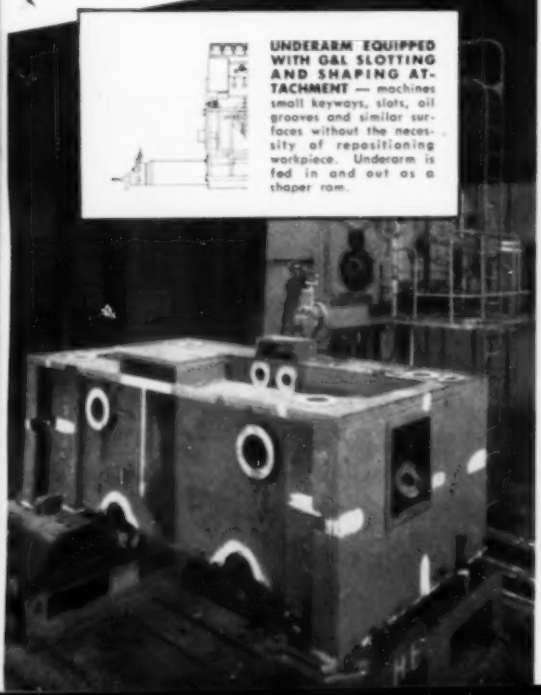
LESS dollar investment



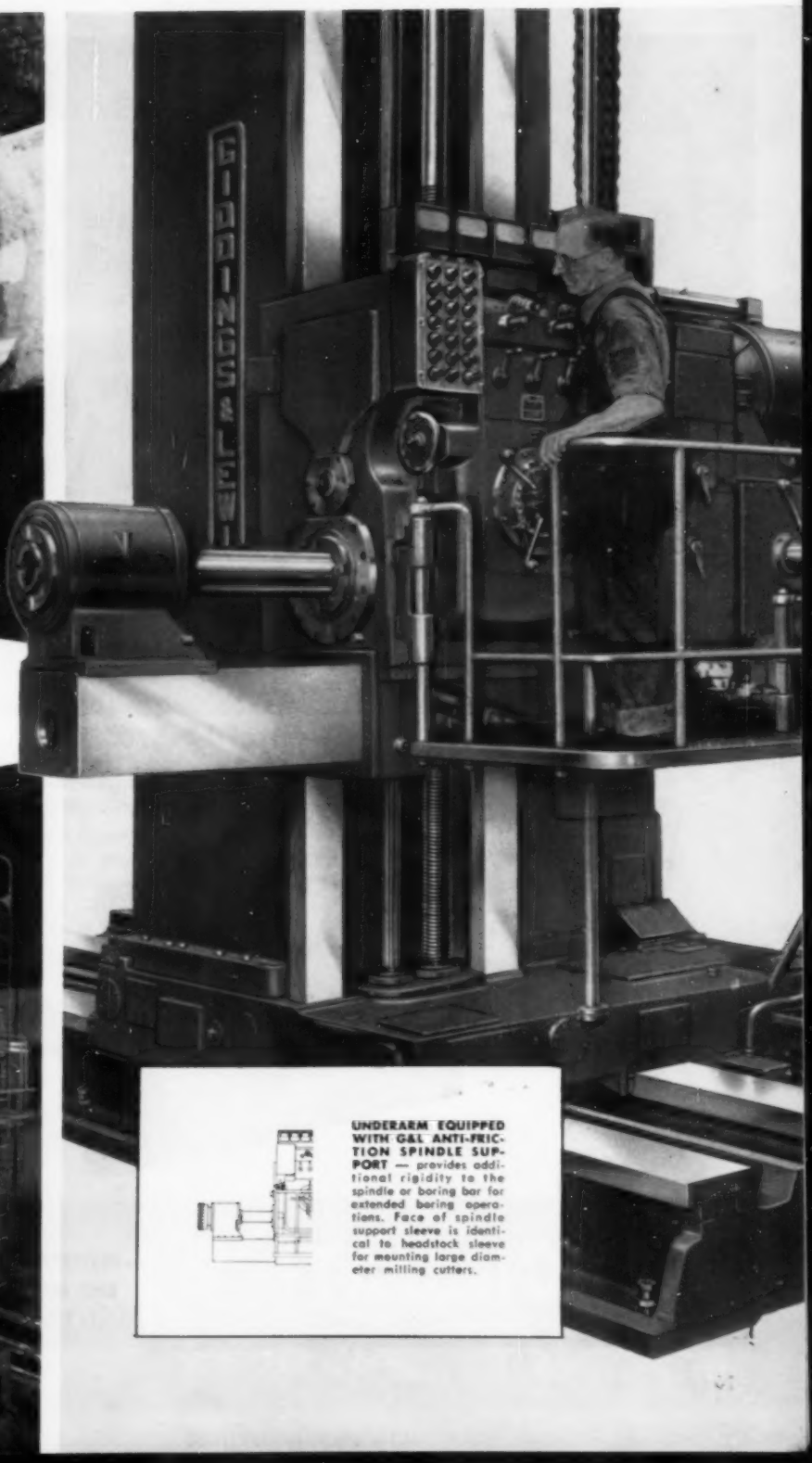
UNDERARM EQUIPPED WITH G&L RIGHT ANGLE AND OFFSET MILLING ATTACHMENTS — unit is driven by machine spindle for machining surfaces in planes other than those possible with spindle alone. Right angle attachment can be used without offset spindle unit when workpiece permits.

support

floor-type machines

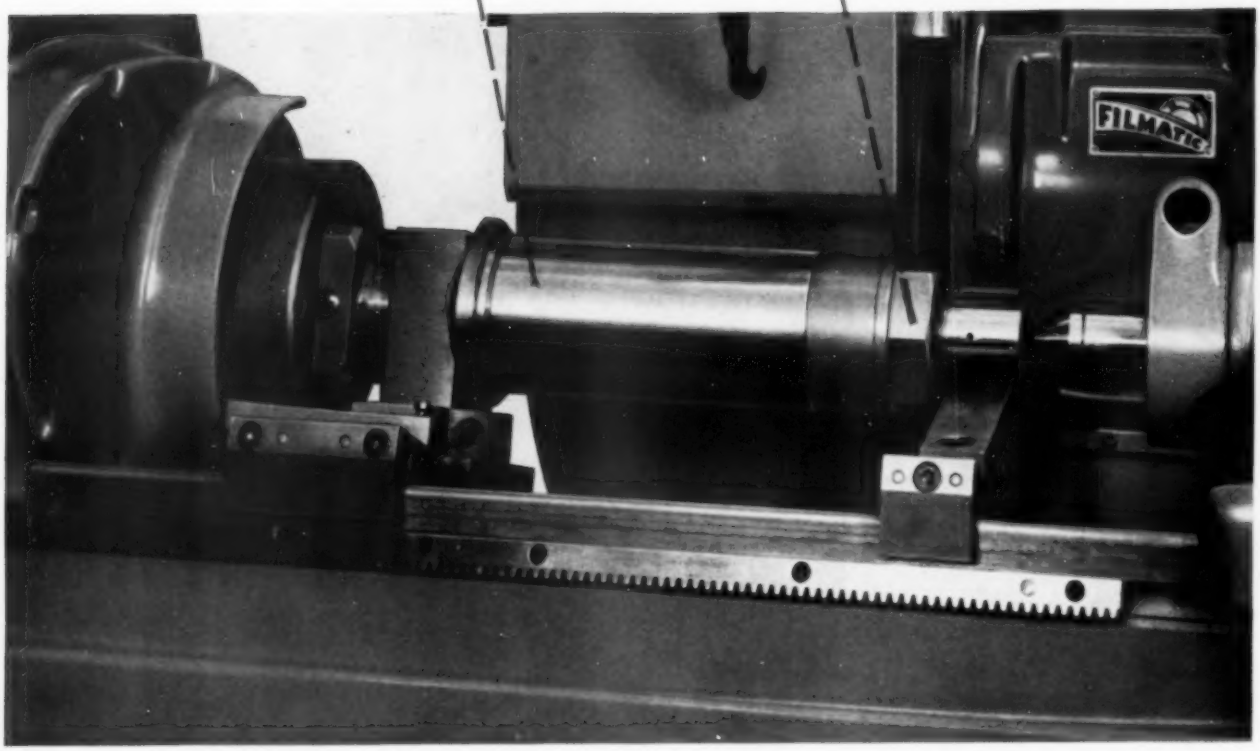


UNDERARM EQUIPPED WITH G&L SLOTTING AND SHAPING ATTACHMENT — machines small keyways, slots, oil grooves and similar surfaces without the necessity of repositioning workpiece. Underarm is fed in and out as a shaper ram.



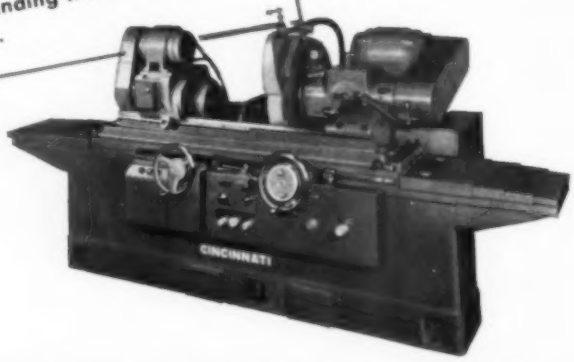
UNDERARM EQUIPPED WITH G&L ANTI-FRICTION SPINDLE SUPPORT — provides additional rigidity to the spindle or boring bar for extended boring operations. Face of spindle support sleeve is identical to headstock sleeve for mounting large diameter milling cutters.

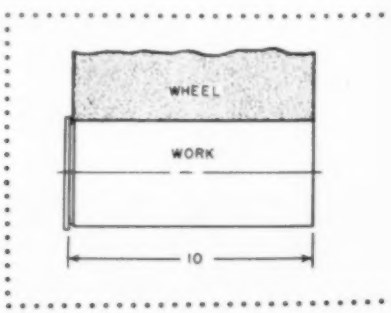
The *LONGER they are



Wide wheel infeed grinding saves time. 7½" to 10" length of thin walled cylinder sleeves are ground in one cycle on CINCINNATI FILMATIC 10"R Plain Hydraulic Grinder equipped with 20 hp heavy duty wheel-head, and 10⅛" wide solid wheel.

CINCINNATI FILMATIC 10"R Plain Hydraulic Grinding Machine. Catalog No. G-661-1.

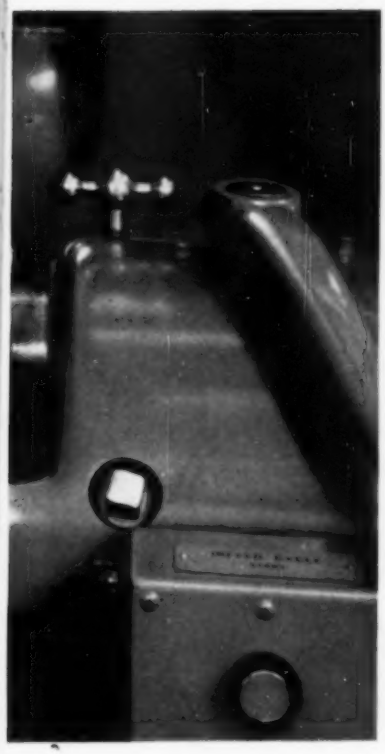




CINCINNATI®

CENTERTYPE GRINDING MACHINES • CENTERLESS GRINDING ROLL GRINDING MACHINES • SURFACE GRINDING MACHINES •

the more you can save



...by Infeed Grinding on Cincinnati Filmatic 10"R Plain with Heavy Duty Equipment

Wide wheel infeed grinding usually saves time compared to traverse grinding, but more machine "muscle" is required. CINCINNATI FILMATIC 10"R Plain has the basically rugged framework to exert this extra muscle, and with a 20 hp heavy duty wheelhead and 1½ hp headstock drive, work up to 10" long can be automatically ground in one infeed cycle just as smoothly and at a lower cost than narrow wheel traverse grinding.

✻**Here's the way CINCINNATI FILMATIC 10" Plain Grinders can be equipped to infeed grind long work:**

Solid wheels, 24" dia. x 10⅛" wide or 30" dia. x 9" wide

Spaced wheels, 30" dia. x 15" wide, up to 9" total width of wheels

The machine illustrated, a heavy duty type with 10⅛" wide wheel, grinds 7½" to 10" length of cylinder sleeves in one automatic infeed cycle. Other cost-reducing equipment includes: air-electric gage sizing... automatic behind-the-wheel profile truing, with counting device... repetitive angular position stopping of headstock spindle... automatic grinding wheel reciprocation. Of course, the grinding wheel spindle bearings are standard FILMATIC; they easily withstand any load the motor is capable of pulling. ¶ It's to your advantage to consider CINCINNATI first for your standard or special centertype grinding machine requirements. Complete information on the conventional 10"R machine may be obtained by writing for catalog No. G-661-1. Look in Sweet's Machine Tool File for brief specs.

Drawing of part.

Part name	Sleeve
Material	Cast iron
Stock allowance	.010" max.
Estimated production	38 per hour at 80% efficiency

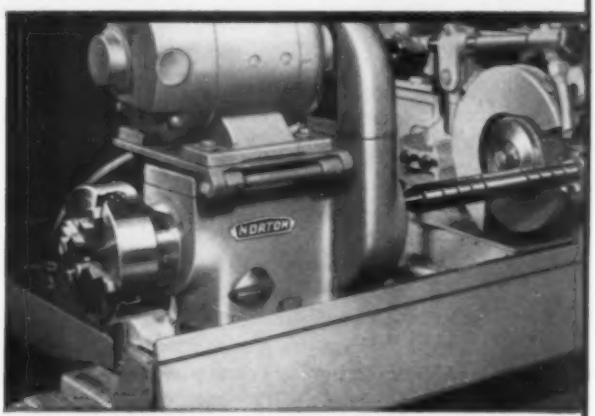
CINCINNATI

MACHINES • MICRO-CENTRIC GRINDING MACHINES
CHUCKING GRINDERS • CENTERLESS LAPPING MACHINES

CINCINNATI GRINDERS INCORPORATED
CINCINNATI 9, OHIO

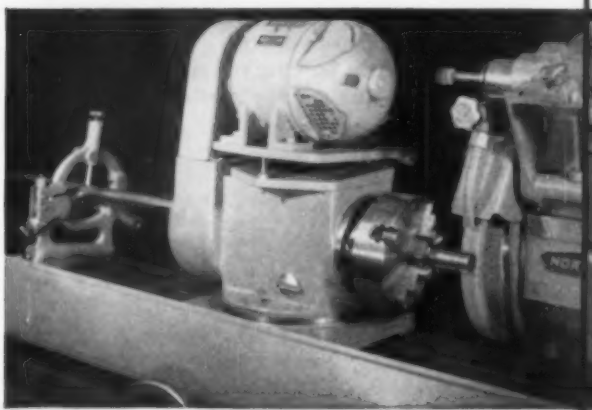
Norton builds extra versatility into universal grinders...

JOB-SPEEDING FEATURES

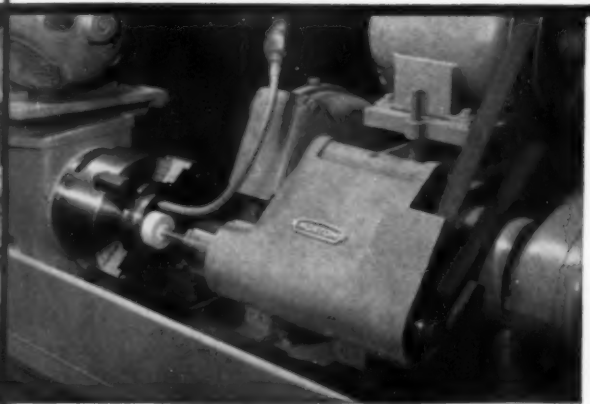


Minimum effort to change from dead center to chucking work. Chuck may remain mounted at back end of headstock while dead-center grinding.

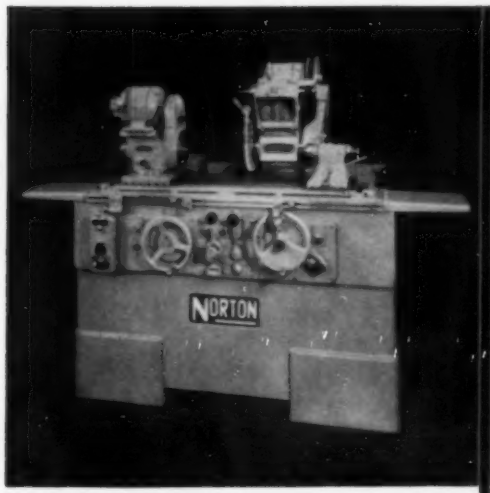
to put extra dollars in your pocket



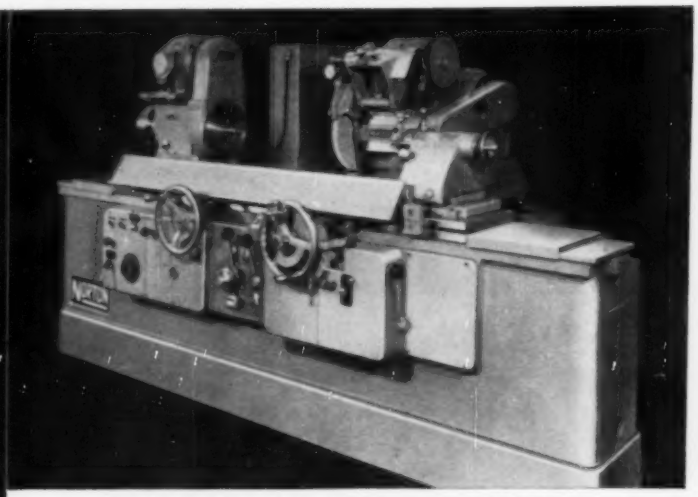
Hollow headstock spindle gives you additional capacity for grinding long bars by passing them clear through and supporting them in grinding position.



Hinged-bracket type internal grinding spindle swings up and out of the way when not in use. This means quicker setups for your I.D. or O.D. grinding.



Norton 10″ universal grinder. Made with 20″ or 24″ nominal lengths between centers. Catalog 170.



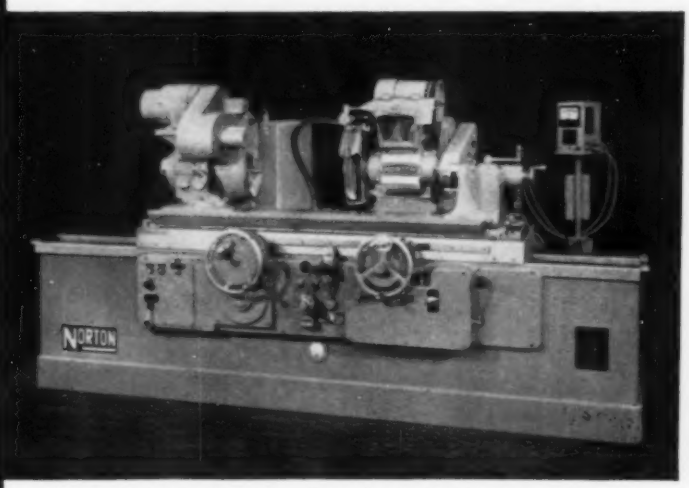
Norton 12″ Type U-4 universal grinder. Made with 36″ or 48″ nominal lengths between centers. Catalog 231.

Many a user rates his Norton universal grinder as a practically "complete grinding department." Why? Because Norton builds extra versatility into its universals for faster external, internal, face, taper and angular wheelside grinding, including many special jobs. Also they're built with many famous job-speeding, cost-cutting features: For example:

Extremely rapid chucking . . . quick change-over to live or dead spindle operation . . . easy work speed changes . . . independent wheel settings that do difficult jobs fast . . . extra capacities on wheel head and headstock . . . precise swivel table alignment with the SWIVALIGN *Dual Electric Indicator, an optional extra.*

Made In The Size You Need

Norton universal grinders are made in 10″, 12″, 14″ and 18″ swing capacities. That means you can get exactly the size to bring you many time-and-money-saving "Touch of Gold" advantages. For complete facts on these high-efficiency machines see your Norton representative or write us direct. And remember: Only Norton offers you such long experience in both grinding machines and grinding wheels to help you produce more at lower cost. NORTON COMPANY, Machine Division, Worcester 6, Massachusetts.



Norton 14″ Type U-4 universal grinder. Made with 36″, 48″ or 72″ nominal lengths between centers and also in 18″ swing capacity. SWIVALIGN* Dual Electric Indicator, at right of picture, measures swivel table adjustments and is optional on all Norton universal grinders. Catalog 819.

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GRINDERS and LAPPERS

Making better products . . . to make your products better

NORTON PRODUCTS: Abrasives • Grinding Wheels • Grinding Machines • Refractories
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District Offices: Worcester • Hartford • Cleveland • Chicago • Detroit
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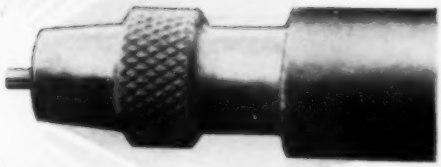
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries



NEW WEST·ING·GUN

Cuts Welding Costs! Speeds Production!

GETS EVERYWHERE!

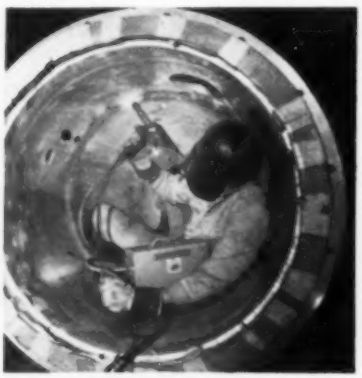
Hard-to-weld Metals Now Welded Automatically! There is now a portable hand gun—for gas-shielded welding of aluminum, mild and stainless steels, bronze, copper and magnesium! Moreover, this hand gun has its *own self-contained wire supply!*

It is named the WEST-ING-GUN. It works with any standard DC welding machine. It has *averaged* horizontal fillets of 22 inches-per-minute—with $\frac{1}{16}$" wire! Throughout *extensive* field tests, this WEST-ING-GUN has *doubled men's daily output!*

OPERATOR FATIGUE "ELIMINATED"! This WEST-ING-GUN "handles" as easily as pointing your finger, to weld in *any* position—regardless of cramped quarters! Its portability between gun and control—between control and power-source—provides complete working freedom and ease—up scaffolding—atop ladders—all around any type of workpiece. This gun weighs only four pounds—including its full, pound reel of wire! Operators working a steady 30% duty cycle, with WEST-ING-GUNS, say they "feel no fatigue at all"!

Welding Remote from Power Source!

20-lb control is readily carried up superstructures! Every shipyard visited, during field-tests, immediately ordered WEST-ING-GUNS!



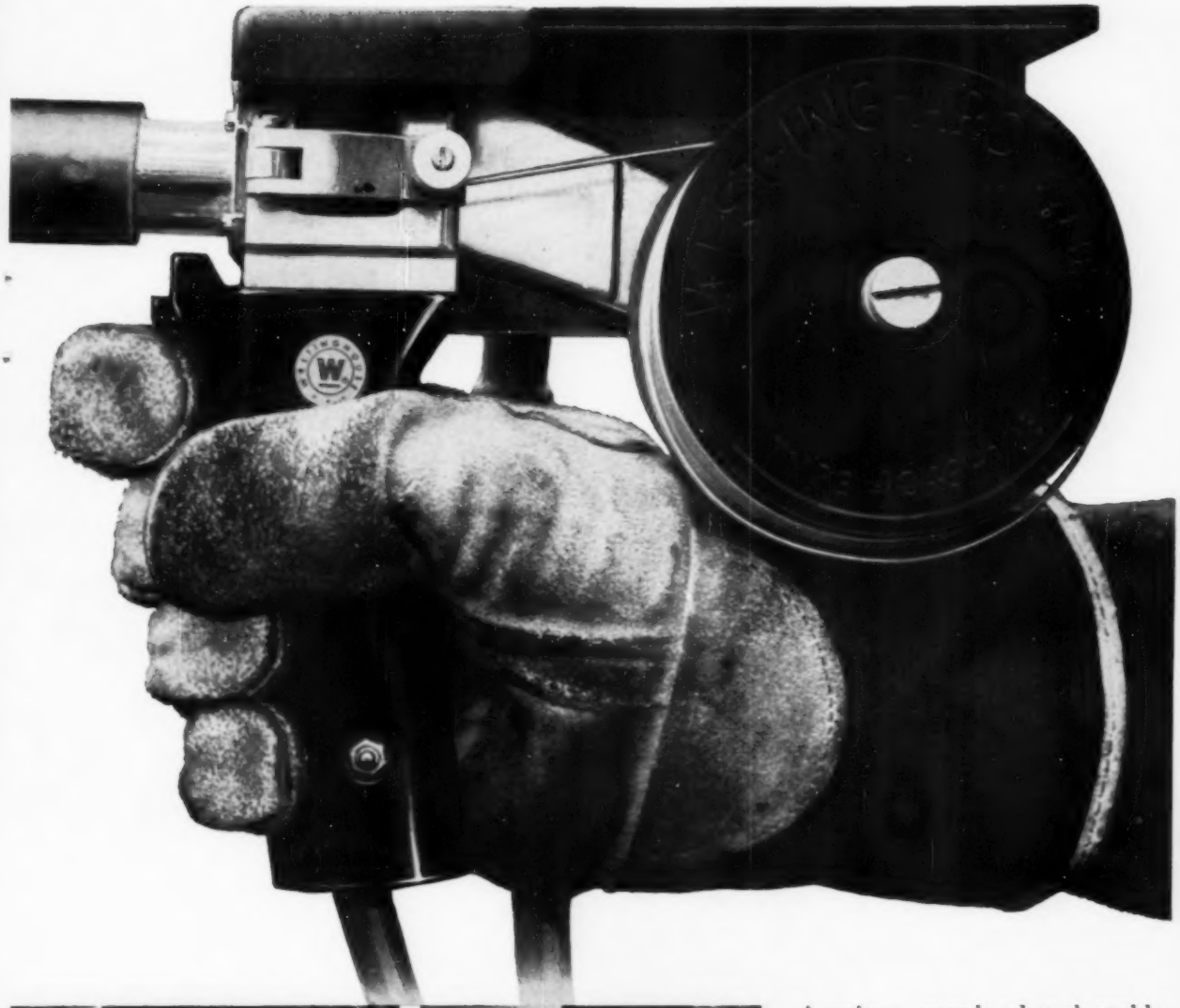
Time Saved in Tight Quarters!

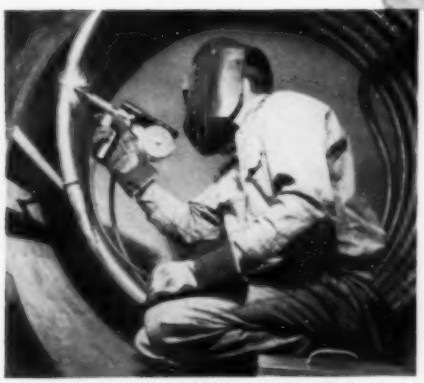
Weld wherever you please! Power and shielding gas are in a single-hose assembly. This permits access to heretofore "impossible" locations!

New Welding Speed on Big Units!

You can take the gun wherever you want to weld! The control stays with the machine! One man can now do the work that used to require two!

Watch Westinghouse for New Developments





Maintenance Welding Simplified!

WEST-ING-GUNS and lightweight control units do the job quickly! Invaluable as a time- and cost-saving production tool!

Aircraft Quality Welds Every Time!

Difficult welds are readily completed with new ease—in production of aircraft equipment—often well back into normally inaccessible areas!

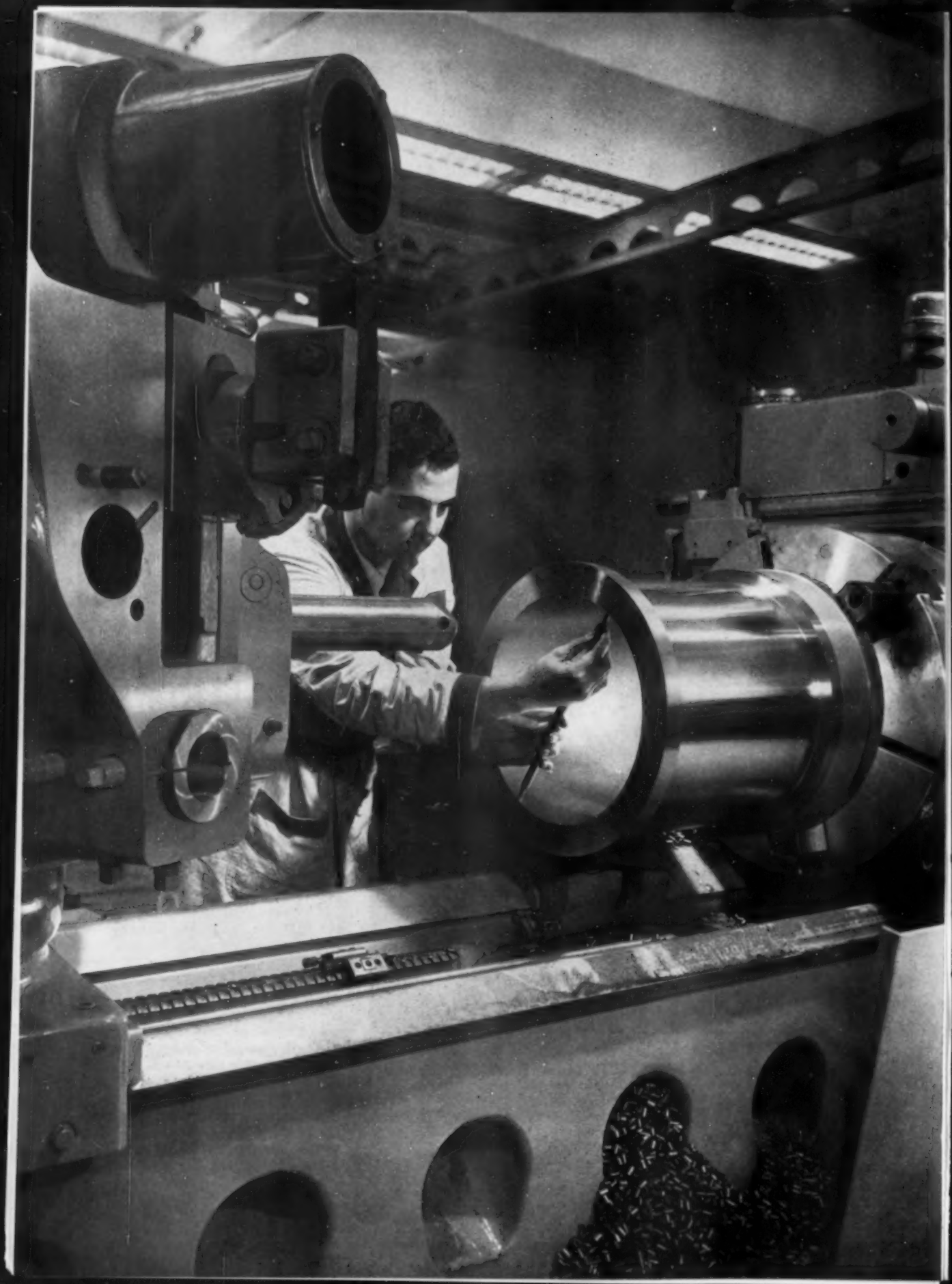
A unique, gear-head replaceable mechanism in the handle drives $\frac{1}{16}$" wire up to 350" per minute (finer wire *twice* as fast)! Wire is "inched" at the touch of a button. The short, 6" travel eliminates wire-feeding problems!

There are WEST-ING-GUNS and the controls available—for any DC welders. The compact, rugged control-unit for each model weighs less than 20 pounds. Virtually *every* welding shop has *countless* applications where WEST-ING-GUNS will save *appreciable* amounts of money!

Avail yourself of the opportunity to see what this new production tool can do for you! Contact your nearest franchised Westinghouse Welding Distributor; or write to the Westinghouse Welding Laboratories, Box 2025-A, Buffalo 25, New York.

J-22100

in Welding



VEE-WAY ACCURACY and EASE OF OPERATION

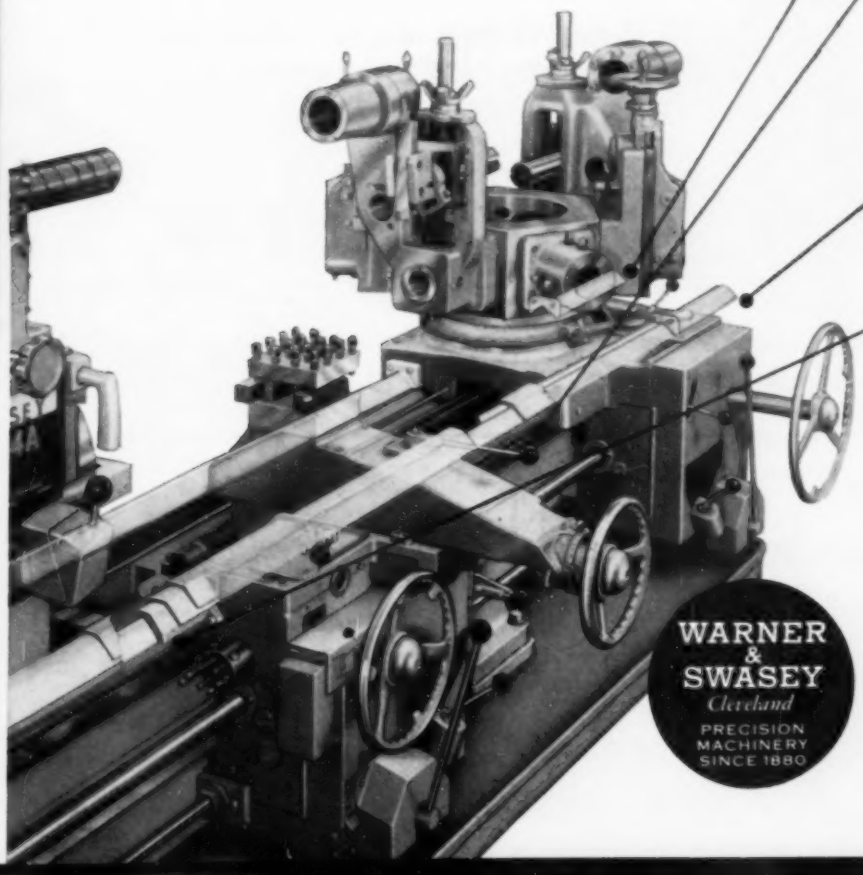
preserved by Warner & Swasey's

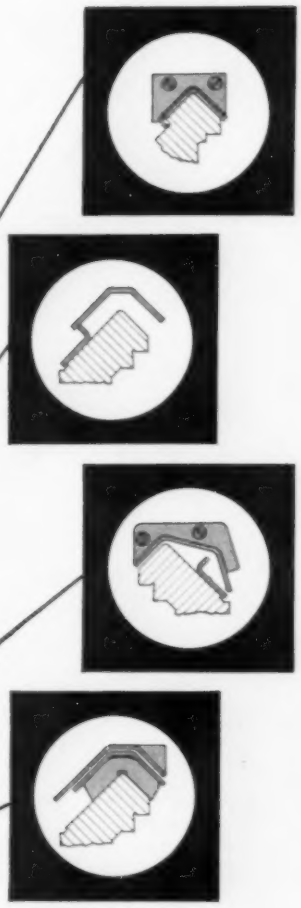
telescoping way covers

Regardless of carriage or saddle positions on the bed, Warner & Swasey's patented Telescoping Way Covers provide complete bedway protection. Tools, gritty materials, cutting fluids, even heavy workpieces can fall on the Way Covers but the accuracy and free-sliding smoothness of Warner & Swasey's exclusive self-guiding Vee-Ways are fully protected throughout years of hard use . . . and with a minimum of maintenance. As a result, dependable, close-tolerance performance is easy to maintain without fighting or pampering the machine.

With Warner & Swasey Saddle Type Turret Lathes, operators stand closer and more comfortably to their work. That's because strength and rigidity of the bedways are achieved through scientific cross-rib construction instead of by mere mass and width of the bed. They report their Warner & Swaseys are easier to handle because all movable units slide on well-lubricated bearing surfaces—enclosed and protected at all times by the patented Telescoping Way Covers.

When operators like the equipment on which they work—production increases. So, why not let our Field Representative show you all the operator advantages designed into Warner & Swasey Turret Lathes? It can save you money.





These exclusive Telescoping Way Covers fully protect the bedways from accidental dropping of heavy objects. Chips cannot work between the Ways and carriage or saddle units to damage important bearing surfaces. Flooding coolant cannot wash away vital lubricant or combine with dust and oil to gum up bearing surfaces.

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

SIMONDS

ARMSTRONG

Drop Forged CLAMPS

LEADERS IN THE DROP FORGED CLAMP FIELD

. . . in design, machining and strength; in completeness of line in both sizes and types.

Designs are based on a full knowledge of clamp uses and requisites. Drop forging assures die-perfect form, texture toughness and freedom from structural faults. Maximum stiffness is attained by a discerning selection of steels with accurate controlled heat-treating, tempering and testing.

For dependability and long useful life, specify and standardize on ARMSTRONG Drop Forged Clamps.

EXTRA DEEP THROAT "C" CLAMPS

Provide extra clearance required for some work. Extremely stiff for weight. Screws and hubs are accurately machined and aligned with machined seats; have sliding pin handles and free-acting swivel caps on point. Bodies have smooth sandblast finish.
(8 sizes to 12" opening)

Write for new ARMSTRONG General Catalog showing almost 5000 industrial tools.

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HEAVY DUTY "C" CLAMPS

Universally recognized as strongest "C" clamps made. Angle nib [illegible] screw alignment against terrific side strain; permit tighter clamping and multiplies thread friction against loosening. Extra large screws are neat treated and hardened at point.
(11 sizes to 12½" opening)

MEDIUM SERVICE "C" CLAMPS

The design and careful selection of steels in this type clamp combine to give it maximum strength and stiffness consistent with convenient weight. Heat treated screw with sliding pin handle and swivel cap on point. Ground seat.
(9 sizes to 18" opening)

TOOL MAKERS "C" CLAMPS

Quality steels, drop forged, heat treated and accurately machined with ground seats. Drop forged screws have both "wing nut" handle for convenience and square necks for tight setting with a wrench. Either "plain" or "swivel" screw types.
(Four sizes: 1", 2", 3" or 4" maximum opening)

SPATTER RESISTANT WELDERS "C" CLAMPS

Extra Deep Throat Pattern (see above). Body, Swivel and Screw are cadmium plated over all to resist welding spatter.
(8 sizes Capacities to 12" opening)

MACHINISTS' CLAMPS

Jaws drop forged, carefully machined and hardened, are extra heavy; will not bend or spring on a short bite and are faced true. Will grip non-parallel surfaces because the under face of the center screw is convex, fitting into a concave seat for tilting.
(Four sizes: Capacities to 4¼" opening)

PARALLEL CLAMPS

Carefully machined from selected grade steel and hardened. Particularly suited for holding work together when drilling or tapping. Rounded jaw ends increase clearance in close quarters. Spring clip holds loose pin in alignment while tightening or loosening.
(3 sizes: Capacities to 2½" opening).

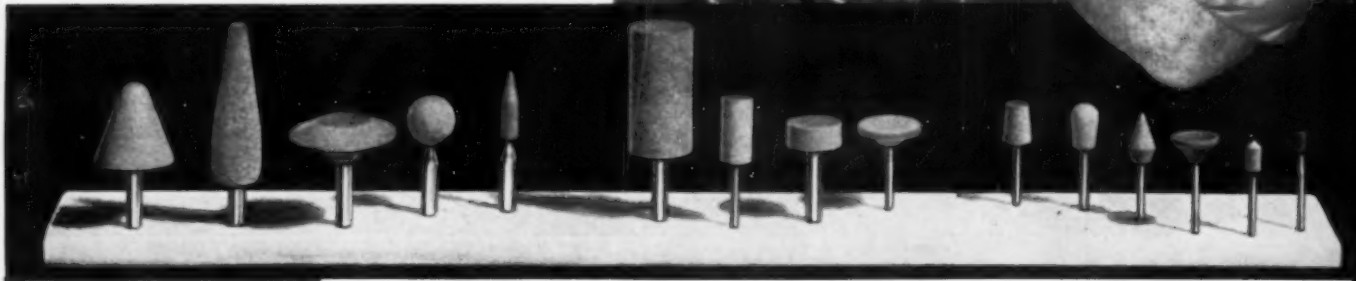
(Not Drop Forged)

SIMONDS
ABRASIVE CO.

Mounted Wheels for IMPROVED grinding

Here are some reasons why these wheels are YOUR best bet for better grinding.

- Accurately contoured wheel face assures top cutting efficiency.
- Wheel strongly bonded to steel mandrel with special cement.
- Mandrel pressure-inserted in most shapes for extra strong binding of wheel to steel.
- Large wheels can be chucked in any position.
- Each wheel carefully tested for concentricity and true running.
- Available in all shapes and sizes.



INDUSTRIAL DISTRIBUTORS — THE RIGHT HAND OF PRODUCTION

Put these dependable grinding tools on *your* machines for superior results in stock removal, internal grinding, slotting, notching, cleaning-up, chamfering, burring or grinding in hard-to-reach places. Write for bulletin ESA-67.

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Dependable know-how
Quick supply

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Division of Simonds Saw and Steel Co.
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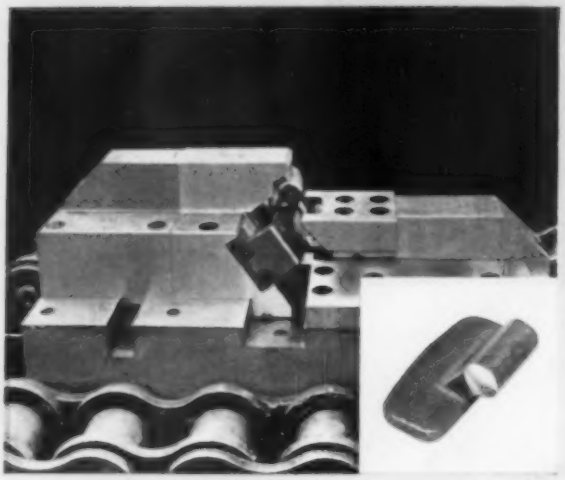
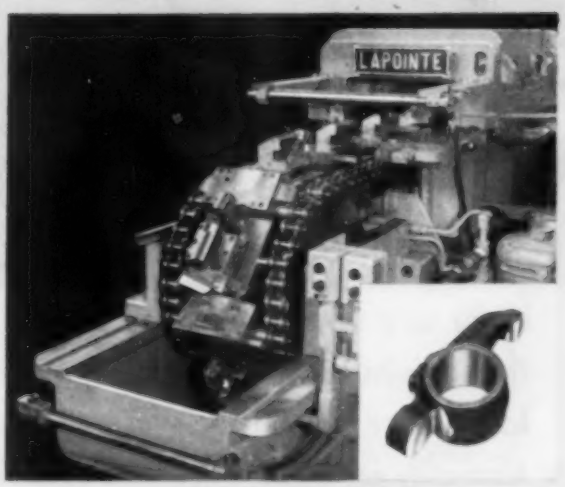


DOOR HINGE



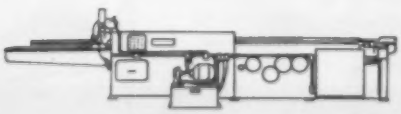
ROCKER ARM

when you're after **mass production** and you want it **fast, accurate . . . at low cost,** your best bet is to broach the part on the

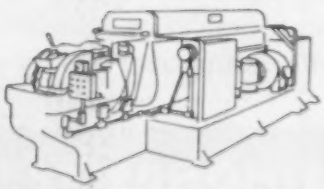
LAPOINTE — **continuous**

BROACHING MACHINE

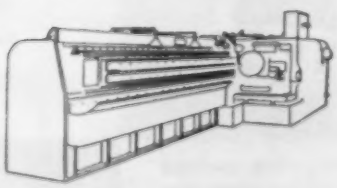
Here's a line of ELECTRO-MOTIVE DRIVE BROACHING MACHINES . . . . . available only at LAPOINTE



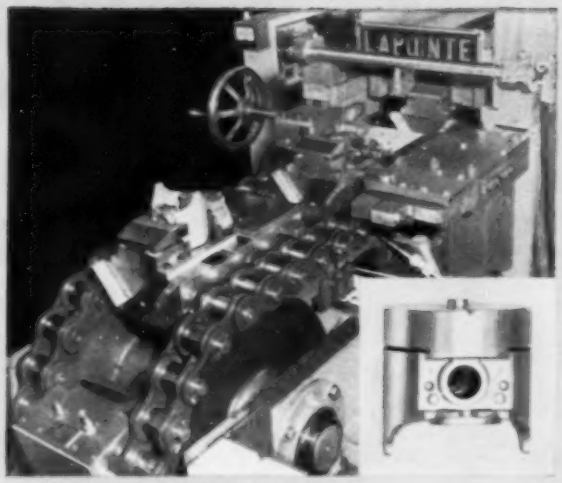
60" STROKE HORIZONTAL, ELECTRIC



CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC



PISTON

BRAKE CYLINDER

Requirements for production of automotive parts are known to be *exacting:* dimensions to close tolerances, machining to fine finishes, long runs on tough-forged blanks.

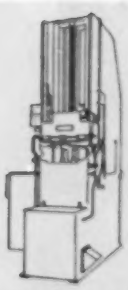
With these demands in mind, the one perfect answer is to use the broaching machine which has proven its worth in numerous automotive applications over a long period of years, *and which embodies all the latest improvements that continuous-broaching machines have to offer.* Most of these improvements were, in fact, originated by Lapointe.

The LAPOINTE-CONTINUOUS-BROACHING Machine is heavy and rigid, built for accurate broaching. Parts are self-ejecting, and the machine can be equipped with hopper feed for full automation. It's easy to load — no strain on the operator. It's available in five standard sizes. It's fully described in our literature which we invite you to send for . . . just say *"BULLETIN CH-1"*

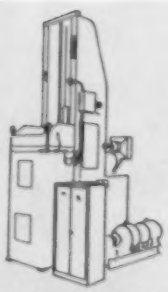
THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

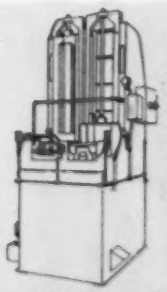
THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC

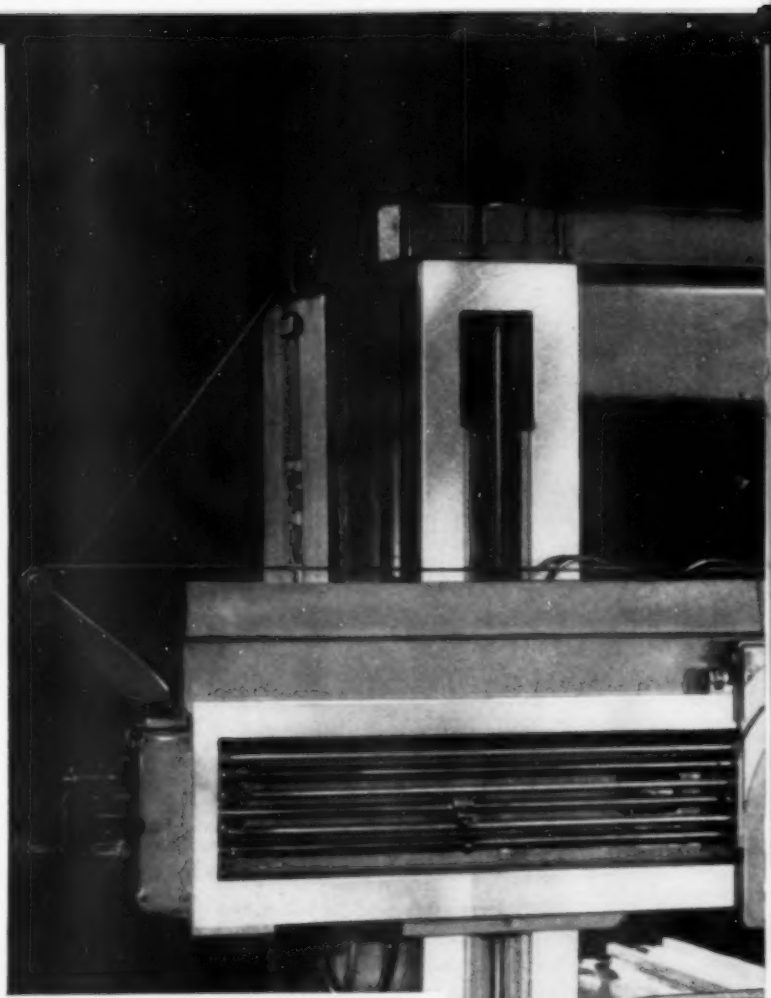


DRVE DOUBLE RAM VERTICAL, ELECTRIC

LAPOINTE

known to be the best in

BROACHING



heavy-duty planing

The Gray Universal is the world's most powerful planer available for conventional planing. Its rigidity and speed are ideally suited for modern carbide cutting.

double-cutting

The flick of a lever, the touch of a button permits double-cutting. Elimination of the idle stroke insures the world's most efficient flat surface machining. Only simple carbide tools are required.

triple-cutting

Rough and rough-finish plane at the same time. Rough by double-cut planing and simultaneously rough-finish with a single point tool. Then finish plane without a tool change.

cross planing

Eliminates extra settings by cross planing the occasional keyways, chamfered corners, and other troublesome small cross surfaces that formerly added hours to your set-up time.

a GRAY the only

This new 84″ x 60″ x 18′ Gray Universal Planer shown in operation at the Koppers Co., cuts going - cuts coming, removes big chips at double rate. There is no idle return stroke to waste precious production hours. Instantaneous reversals with heavy duty double-cutting make this the first REAL new development in modern planers ...*a GRAY exclusive.*

Double tables further virtually eliminate the costly set-up time required by ordinary planers.

The multiple savings received by users of the new Gray Universal make it a wise investment.

If it's new... it must be a GRAY.

The G. A. GRAY Co.,
Cincinnati, Ohio

GRAY Universal Planer shown in operation at the Baltimore plant of Koppers Company, Inc., Metal Products Division.

new planer

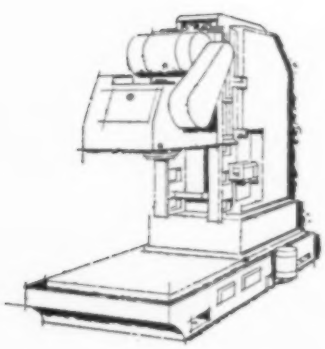
News in Machine Tools

New M&M Upright Drilling and Boring Machines team ruggedness with application versatility

Heavy duty drilling and boring are a snap for these new M&M machines. And talk about versatility! By accommodating many types of heads, fixtures, indexing tables and bases, these units are adaptable to a truly wide variety of machining operations.

Automatic cycle includes rapid traverse down, feed and rapid return. Variations of this automatic cycle are available. Other vital statistics include:

- up to 60 HP capacity
- available in 15″ and 30″ stroke
- vertical slide 26″ wide, 48″ long, 20½″ across the ways
- positive cam-actuated feed valves
- slide-mounted cams for speedy stroke setting changes
- column can be arranged with a variety of risers for wide range of large work



Models of this machine are available to suit your problem.

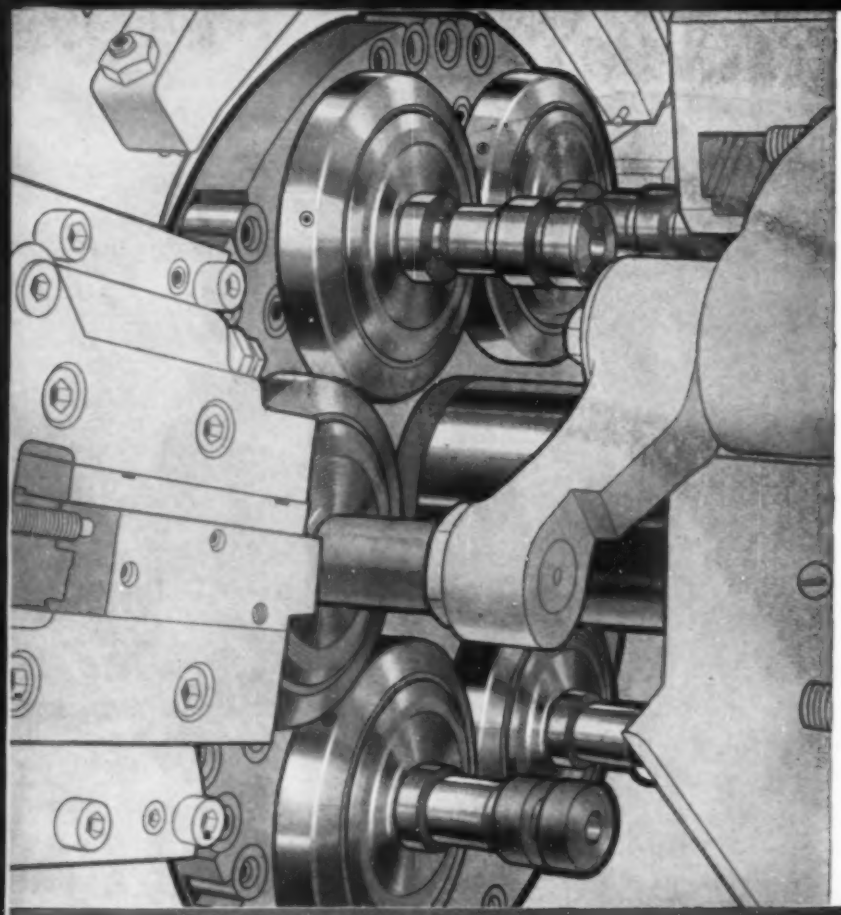
Find out how this versatile metalworking machine can add flexibility to your present machining operations. Contact your nearby Motch & Merryweather representative, or write: Motch & Merryweather Machinery Company, 1250 E. 222nd St., Cleveland 17, Ohio.

BUILDERS OF AUTOMATIC PRECISION CUT-OFF,

MOTCH AND MERRYWEATHER

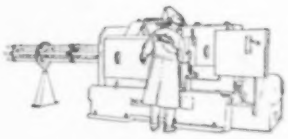
Machine Tool Manufacturing Division
Cutting Tool Manufacturing Division
CLEVELAND
Avey Division, Cincinnati

MILLING, DRILLING AND SPECIAL MACHINERY

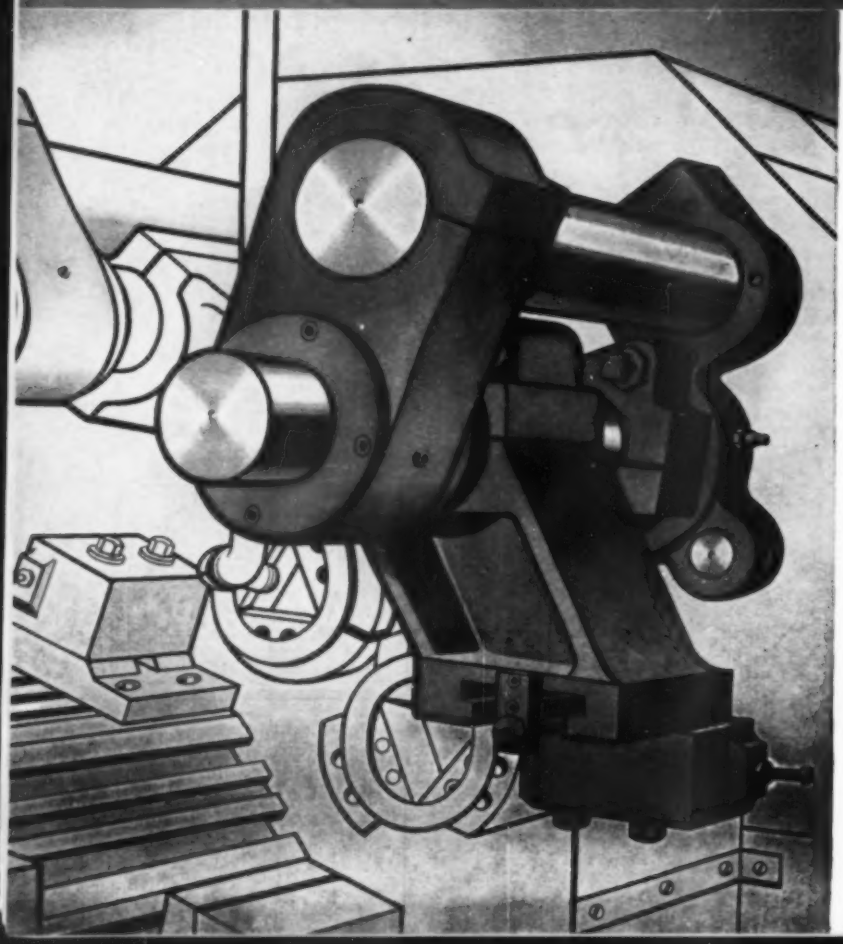


Look at New Britain's

new automatic bar machines

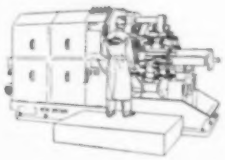


The widest range of spindle speeds among machines of comparable capacity and accuracy.



Look at New Britain's

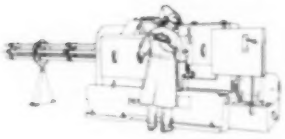
exclusive chucker arms



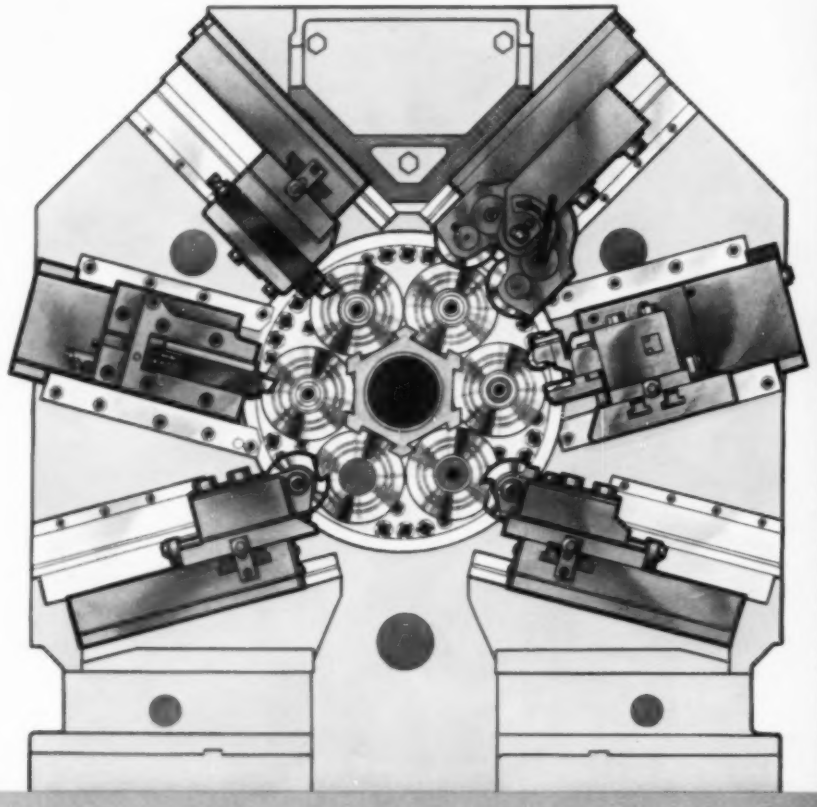
All the ruggedness of a cross slide, but with two-way motion for cutting O.D.'s, I.D.'s, tapers and radii and for recess boring, in addition to facing cuts. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

Look at New Britain's

new cross slide arrangement

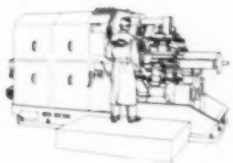


Independent radial cross slides in *all* positions, providing maximum clearance for more cross slide operations.

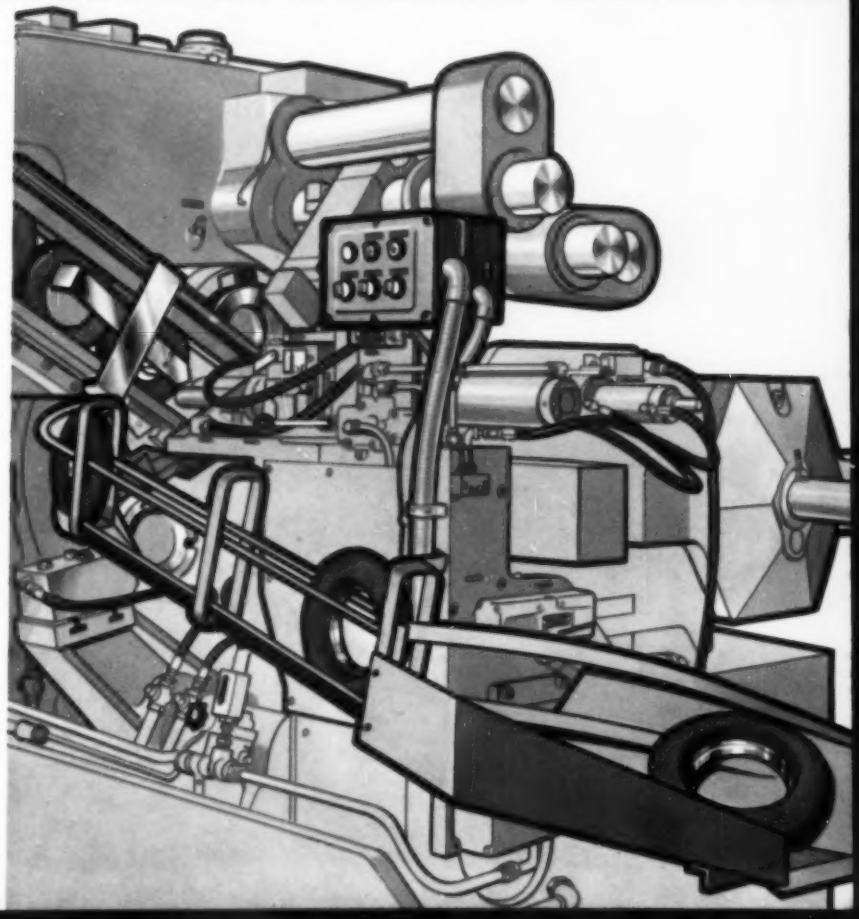


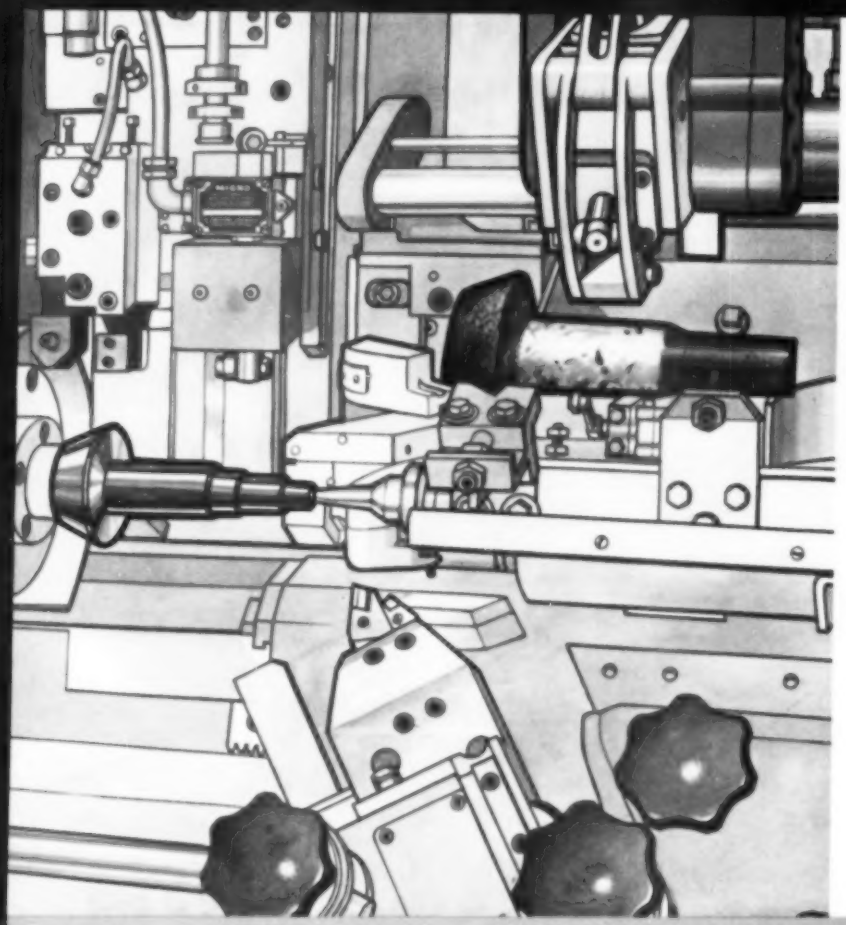
Look at New Britain's

open-end chucker design



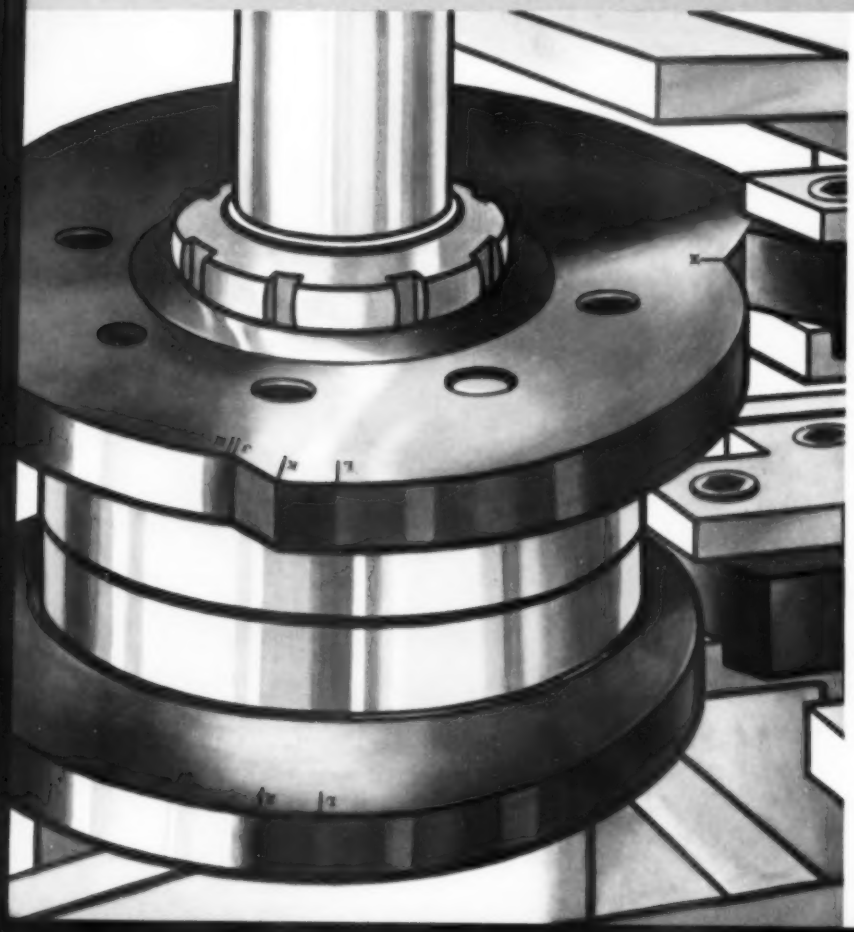
Greater accessibility for all applications and particularly well adapted to automatic handling of pieces. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.





Look at
Automatic Loading on
New Britain +GF+

This basic optional feature can make money for you whether you are working with forgings, bar slugs, or bar stock.

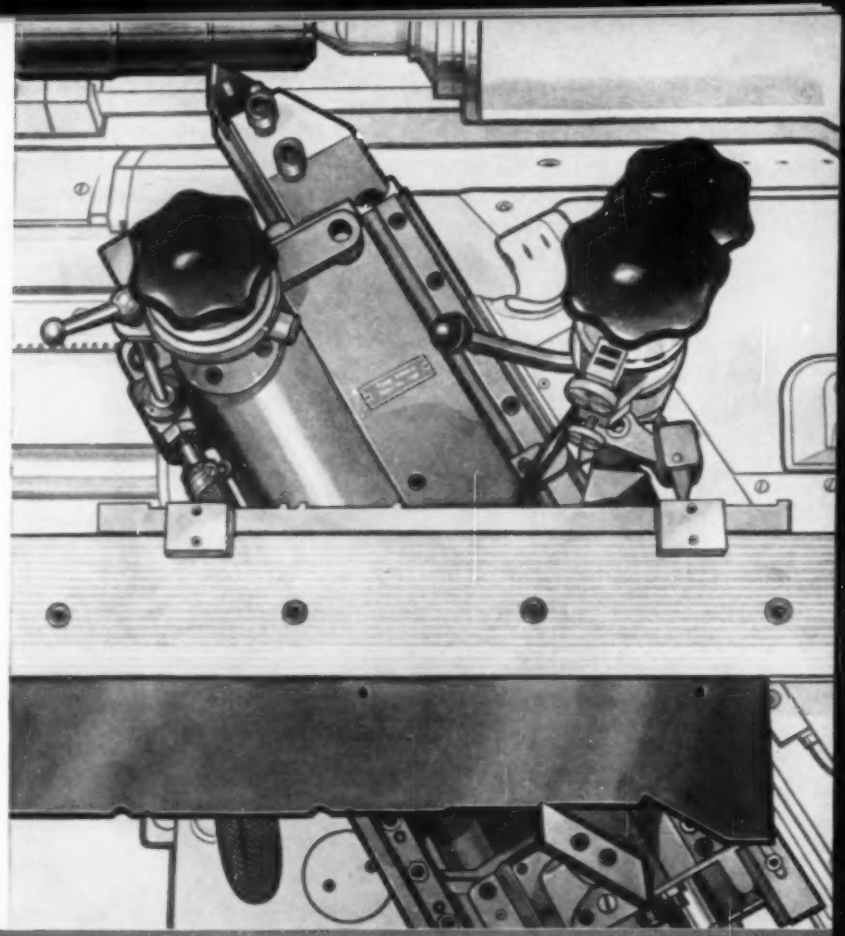


Look at New Britain's
cam-controlled boring machine

When you are working to tenths there is no substitute for the positive tool control that only precision cams provide. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.

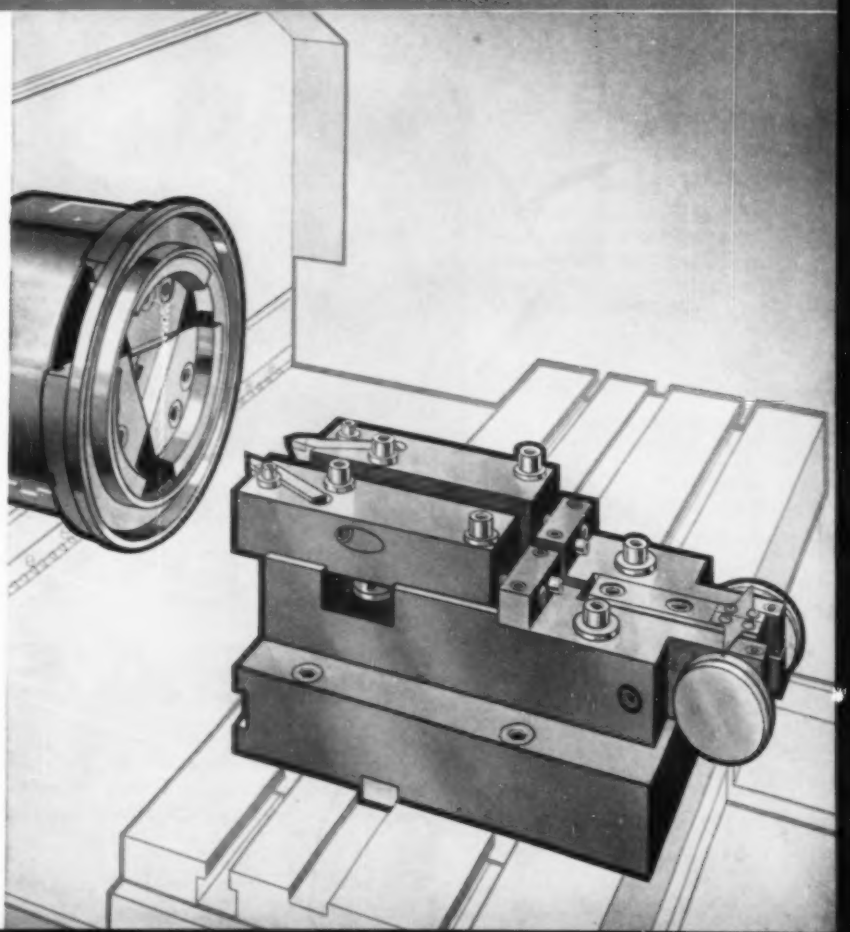
Look at
Single Point Tooling on
New Britain +GF+

Outproduces gang tooling setups by reducing tool change time practically to zero, and by cutting at maximum speeds and feeds for tool efficiency.



Look at New Britain's
simple approach to problem pieces

Low cost per piece is inherent in New Britain Precision Boring Machines because of their simplicity, versatility, speed, repetitive accuracy and inexpensive tooling. New Britain-Gridley Machine Division, The New Britain Machine Company, New Britain, Connecticut.



How Earl Singleton cut the cost of

With 28 years experience in the abrasives industry, Bay State distributor Earl Singleton figures that one improvement in a grinding operation ought to lead the way to another. And, judging by the results he's produced, he's 100% right.

This is a good example of what happens when you tell a Bay State distributor your problem and give him a chance to experiment.

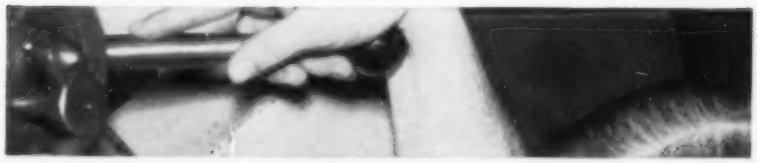
The problem: Grinding teeth on heavy traction gears for diesel locomotives at the Indianapolis plant of a large manufacturer of components for diesel locomotives.

The man: Earl Singleton, Abrasive Engineer at Browning Tool & Supply Co., Indianapolis.

Working with the foreman of the department, Singleton came up with a 14" grinding wheel that cost 14% less than the premium-priced wheel it replaced. It held form better, too, and so didn't need to be dressed as often.

That was fine. But Singleton figured they might also get more pieces per wheel if they used a slightly larger wheel. After exhaustive tests to ensure complete safety, a 15" wheel was put to work and wheel life was more than doubled . . . from 16-17 pieces to 35-36. Down-time was reduced, too.

Even if you seem to have no particular grinding problems at the moment, it's worth while getting acquainted with the Bay State distributor in your area. Like Earl Singleton, he may find ways to save you money that haven't occurred to the people in your shop. *Better grinding at lower cost — that is his business.*



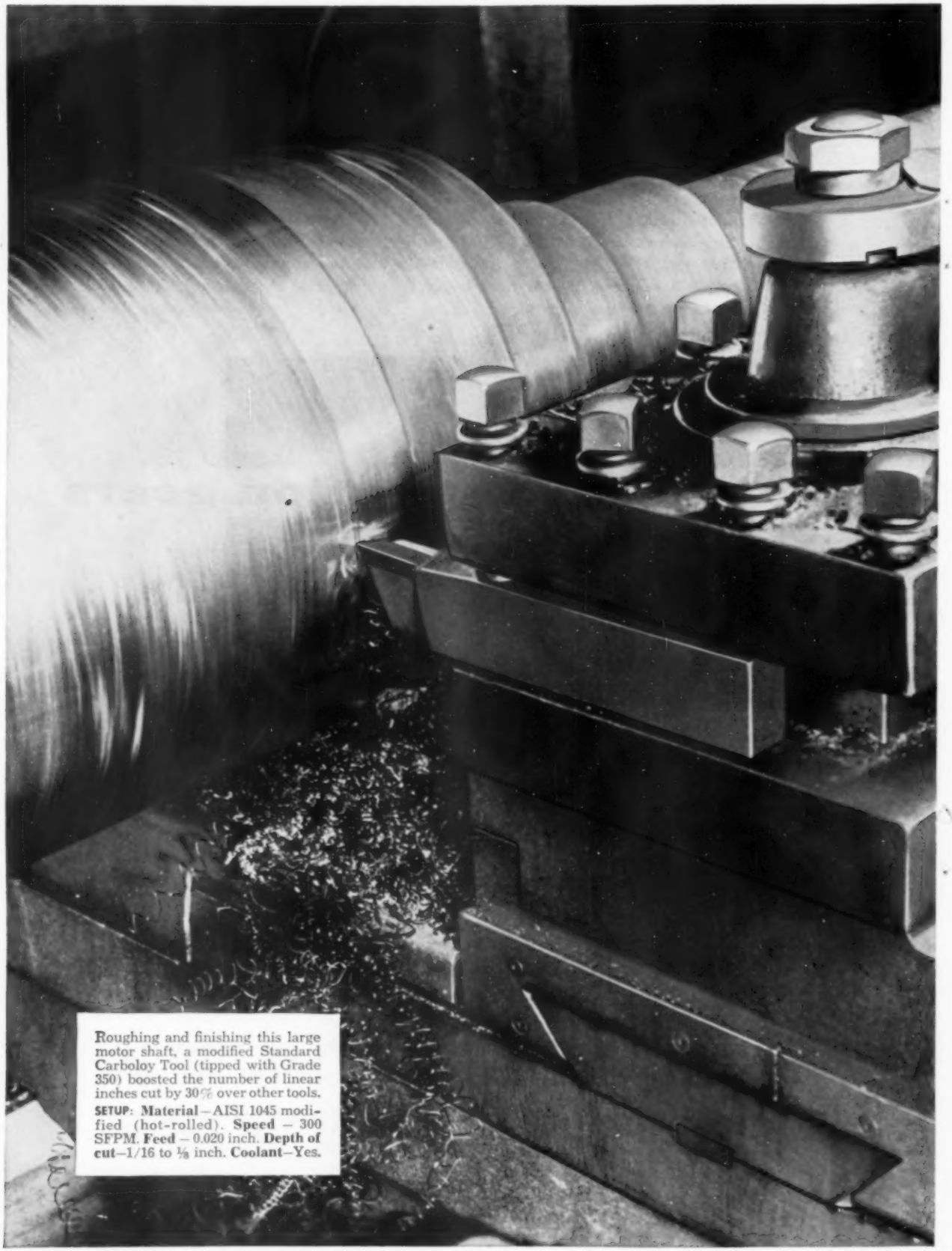
grinding heavy traction gears

Bay State specification cut wheel cost 14% . . . *and* wheel held form so well that wheel life was doubled under regular production conditions.

BAY STATE WHEELS of PROGRESS

BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.



Roughing and finishing this large motor shaft, a modified Standard Carboloy Tool (tipped with Grade 350) boosted the number of linear inches cut by 30% over other tools.

SETUP: Material—AISI 1045 modified (hot-rolled). **Speed** — 300 SFPM. **Feed** — 0.020 inch. **Depth of cut**—1/16 to ⅛ inch. **Coolant**—Yes.

3 reasons why industry specifies more Carboloy® braze-type tools than any other brand

1 Consistent, record-breaking performance

Tough jobs, like the one at left, are the real test of a tool's performance. And in plant after plant, Standard Carboloy Tools have proved that they deliver maximum production – at lowest cost per piece. They're made by the company that pioneered "standards." Their shanks are of the finest cold-drawn steel. Their carbide edges are automatically diamond-ground for accurate machining.

2 Complete range of styles, sizes, grades

Standard Carboloy Tools are available in thirteen styles, hundreds of sizes. Used "as is" or adapted to specials, they can handle up to 80% of all single-point jobs – from rough turning to precision threading. They're available with tips of Carboloy Extra-Performance steel-cutting grades 330, 350, and 370. Or, with carbides for cast irons, super alloys, nonferrous and nonmetallic materials.

3 Immediate delivery from local stocks

There's no waiting for "long distance" delivery when you order Standard Carboloy Tools. Authorized Distributors of Carboloy cemented carbides in 140 cities keep full stocks on hand for off-the-shelf delivery. Your local Carboloy Distributor is listed in your Yellow Pages. Call him today. Or write: *Metallurgical Products Department of General Electric Comapny, 11149 E. 8 Mile Ave., Detroit 32, Michigan.*

CARBOLOY®
CEMENTED CARBIDES

GENERAL ELECTRIC

form INTERNAL THREADS

BESLY

X-PRESS® TAPS

- Eliminate tap breakage due to chips
- Stronger because there are no flutes
- Produces stronger threads by compacting metal
- No cutting edges to wear down
- Provide fewer tool changes for more pieces per shift
- No chip interference permits tapping to bottom of blind holes
- Reduce plating failures, no chips in bath
- Drill breakage reduced especially in smaller sizes, because larger tap-drills used
- Recommended speeds higher than for conventional tapping
- Speed cycling time for automatic machine tapping
- Reduce cost per tapped hole wherever successfully applied

TESTED . . . PROVED

Aluminum Screw Machine Part —
Company gained 27,000 threaded holes per X-Press Tap vs 800 per conventional tap previously. Cycling time reduced from 6.4 to 3.6 seconds.

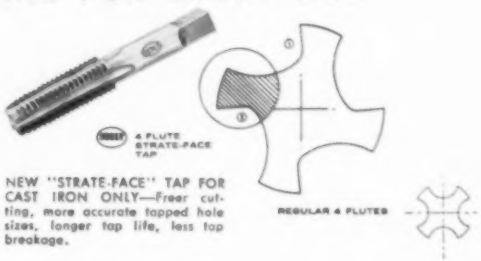
Zinc Die Cast Part —
Maker now gets 20,000 to 25,000 threaded holes with X-Press Taps, opposed to only 1000 before. Tap breakage due to chips was also eliminated.

Seamed Copper Telephone Part —
10,000 average threaded holes per X-Press Tap now achieved by this producer vs less than 200 by former method with conventional taps.

½ Hard Brass Screw Machine Part —
Phenomenal results by this user — 300,000 pieces per X-Press Tap, 250 previously. Excessive conventional tap breakage caused low rate before.

Names and Data Furnished on Request

BESLY HAS A COMPLETE TAP LINE FOR EVERY JOB



NEW "STRATE-FACE" TAP FOR CAST IRON ONLY—Freer cutting, more accurate tapped hole sizes, longer tap life, less tap breakage.

STANDARDS — immediate delivery. MODIFIED STANDARDS and "SPECIALS" — fast

without cutting

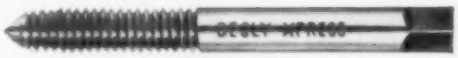
New Revolutionary Tapping Principle Cold Forms Internal Threads In . . .

- COPPER
- BRASS
- ZINC
- LEADED STEELS
- ALUMINUM
- LEAD
- DIE CASTINGS
- OTHER DUCTILE METALS

CONVENTIONAL TAPPING METHOD
Produces chips that may clog flutes, cause loading. Result—excessive breakage.
Grain lines of metal are cut.
CHIPS

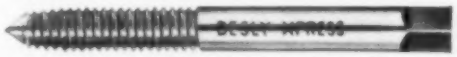
BESLY X-Press Tapping is a cold forming or swaging process for producing internal threads in ductile metals. The desired thread is formed under pressure. The grain fibers follow the contour of the thread, as in good forgings. They are not cut away as in conventional tapping methods. Complete application details are available — see your Besly distributor, or send coupon. *Where this new tool can be successfully applied the results are* phenomenal! *It would pay you to try them yourself — NOW!*

"SR" Style X-Press Taps—for through or bottoming holes.



"P" Style X-Press Taps—for through holes, or bottoming holes with ample clearance.

"B" Style X-Press Taps—for bottoming holes only.



"PC" Style X-Press Taps—same work as "P" Style series, except the root diameter controlled at 75% of thread.

SEE YOUR BESLY DISTRIBUTOR or send coupon

Engineering, Service and Specials . . . are a Besly Specialty

BESLY

BESLY-WELLES CORPORATION

Est. as C. H. Besly & Co. 1875

120 Dearborn Ave., South Beloit, Illinois

Grinders and Abrasives • Taps • X-Press Taps • Drills • Reamers • End Mills • Tool Bits • Gages • Carbide Tipped Tools, Blanks, Lapped Toss-away Inserts and Holders

CLIP TO YOUR LETTERHEAD

Send X-Press Tap data ..... ☐
Send Drill Catalog ..... ☐
Carbide Catalog ..... ☐
Gage Catalog ..... ☐

Your Name _____

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Detroit DIE SET CORPORATION

You can have a free copy of our 60-page catalog by asking for it. Details over 2000 stock precision and commercial die sets—plus accessories.

2895 WEST GRAND BOULEVARD • DETROIT 2, MICH.

Offices in Principal Industrial Centers

lodge & shipley model X lathe paid for itself in just 18 months!

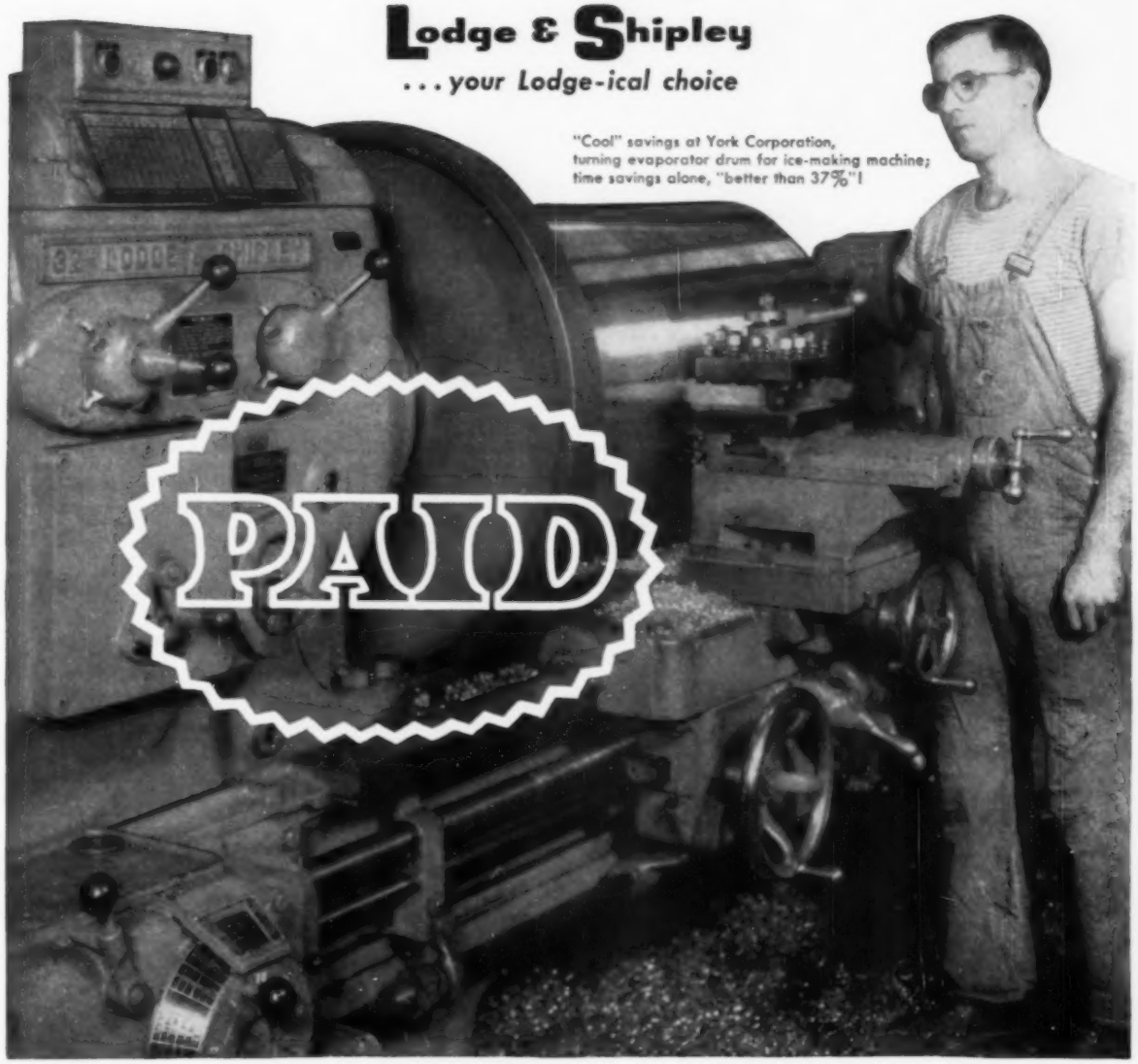
Time savings on a single workpiece, an evaporator drum 24" in diameter and 35" long, have paid for a Model X Lathe in just 18 months. The user, York Corporation, Division of Borg-Warner, records per piece savings at $25.92, saving 172.8 minutes against a previous time of 465.5 minutes per piece. Annual savings figure to $12,400!

Conservatively priced yet ruggedly durable, Lodge & Shipley Model X Lathes are an outstanding value with speed, power and accuracy equal to lathes costing far more.

If you would like a complete case history report on the Model X performance outlined above, write today: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.**

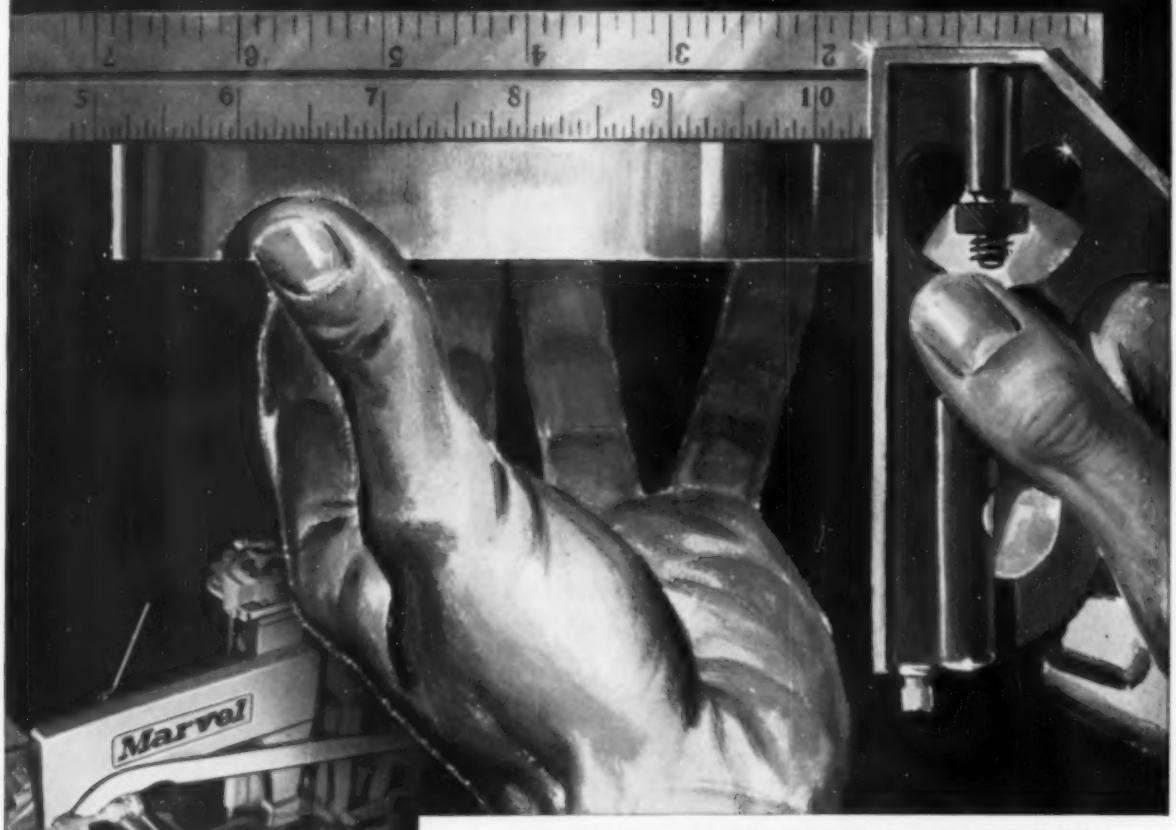
Lodge & Shipley

. . . your Lodge-ical choice



"Cool" savings at York Corporation, turning evaporator drum for ice-making machine; time savings alone, "better than 37%"!

IN CUTTING-OFF OPERATIONS...



...SPEED WITHOUT ACCURACY IS COSTLY!

Efficient cut-off of steel blanks from bars demands a combination of speed *and accuracy*. MARVEL, and MARVEL alone, achieves this combination with machines capable of delivering feeds and speeds which fully utilize the strength and heat resistance of the modern high speed hack saw blade.

MARVEL dual power feed and crank lever method of reciprocation are two exclusive features designed to give increased speed and efficiency. This unique dual power feed employed on the Series No. 6 and No. 9 MARVEL Ball Bearing Hack Saw Machines, simultaneously controls both positive feed depth and feed pressure, automatically adjusting both pressure and depth of feed correctly in proportion to the number of teeth in contact with the work. This automatically forces the blade to cut as deeply as possible and practical on every stroke, without demanding the attention of the operator. As a result, the work is cut-off in the fewest possible number of strokes. Quick return of the saw frame on the non-cutting stroke, accomplished by the crank lever, delivers 33⅓% more cutting strokes per minute without increasing the blade velocity on the cutting stroke.

Accuracy is assured by the construction of the machine itself. Anti-friction ball or roller bearings are used at all load carrying points. The saw frame reciprocates on fully enclosed special design ball bearings which are factory adjusted with a pre-load, assuring permanent frictionless rigidity. Saw frame, saddle, and upright are precision machined and fitted to form a rigid integral unit capable of withstanding any cutting load with no deflection or side movement.

These exclusive features found only in MARVEL Hack Saw Machines, together with the unequalled performance of the unbreakable MARVEL High-Speed-Edge Hack Saw Blade, form a team that guarantees the fastest, most accurate cutting-off.

S-1300

There is a MARVEL field engineer near you capable of intelligently discussing your cut-off work. Send for catalog C-55, and the name and address of your nearest MARVEL field engineer.

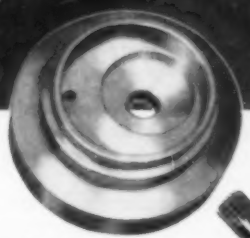
ARMSTRONG-BLUM MFG. CO.
5700 WEST BLOOMINGDALE AVE. • CHICAGO 39, ILL.

Metal Cutting **MARVEL SAWS**
Better Machines-Better Blades

DAYSTROM
Electric Corp.

– puts it on a RIVETT!

Battery of Rivett 1020S Lathes in the Research and Development Division of Daystrom Electric Corporation, Poughkeepsie, N. Y.



Brass piece with off-center counterbore and through-hole completely machined on a 1020S Rivett.

Machined on a 1020S from 4140 steel after tempering at a Rockwell hardness of C 20-25.

Productivity!

Daystrom machines model parts with an eye to normal manufacturing methods. For this reason Daystrom highlights an important Rivett feature — productivity — in its statement:

"We have found that the Rivett 1020S Lathe is one of the most useful and all around productive machines in our model shop, and is so constructed that it is easy for an average operator to obtain the dimensions and finish necessary in our work."

"Model work requires holding concentricity to .001" T.I.R. between several diameters; turning is often held to several tenths. And, a finish of 32 micro inches and better is quite easily obtained!"

Inquire about the 1020 Toolroom Precision Lathe now. Write for 16-page catalog and the name of your nearest dealer.

RIVETT LATHE & GRINDER, INC.
Dept. AM-2 Brighton 35, Boston, Mass.

RIVETT
"Steelway" Lathes

VK

USE OUR SKILLS on YOUR LAPPING PROBLEMS

If that tough production part has Gage Characteristics, try the Van Keuren Precision Lapping Service--

The Van Keuren Co. laps optical flats to an accuracy of .000001", gage blocks to .000004", plug gages to .000010". Your job may not be this precise, but it's a safe bet that VK skills can save you money on lapping problems involving size, flatness, parallelism or fine surface finish. If that tough production part has at least one gage characteristic, ask for a quotation from VK.

We lap flat and cylindrical work in both metals and nonmetals. Sealing rings and plates for pumps and pressure devices, precision pins, spacers, pistons, punches, **carbide pivots,** valve parts, instrument components and parts for testing inspection equipment, are among the customer items handled economically here in our plant.

If you require lapped or polished surface finishes in the order of .5 to 5.0 RMS, or dimensional tolerances from .000001" to .0001", The Van Keuren Co. can probably help on the problem. The "rule of thumb", as suggested above, is "at least one gage characteristic."

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK

39th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . . Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . . Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service.

Turbine spiral case being fabricated of USS "T-1" Steel in the shop of the S. Morgan Smith Co., York, Pa. Plates ranged in thickness from ½" to 1 15/16".

Taming the mighty Snake River with turbine spiral cases of USS "T-1" Steel

Stronger steel reduces weight . . . cuts costs

Four of these huge spiral cases are being built for the Idaho Power Commission for use in the Brownlee Dam on the Snake River near Robinette, Oregon. They are designed for a 250-foot head of water. The inlet is 18 feet in diameter and each turbine will generate 144,000 horsepower at a speed of 128.6 rpm. Water will flow through the cases at a rate of 5,640 cubic feet per second.

Because of the fierce pressure, it was obvious that a strong steel was required. USS "T-1"* Steel was selected because it has a minimum yield strength of 90,000 psi. What's more, it can be fabricated, is readily weldable and has high resistance to impact abrasion.

Cost savings. By using USS "T-1" Steel, there will be substantially less shipping weight across the country and less weld time and weld metal, both in the shop and on the job site. Had carbon steel been specified, double thicknesses would have been required.

Fabricating operations. Projection of the dimensional outline on the plates was done with Lumitrace. Plates were cut to size by flame-cutting and rolled cold to shape. Some parts were finish welded, others were tack welded and assembled. The spiral case was then disassembled and shipped. Finish welding of segments is to be done at the dam site.

This job points up the economies possible with the use of USS "T-1" Steel. Why not use it for your own equipment? Write for our "T-1" book containing complete information. United States Steel Corporation, Room 2801, 525 William Penn Place, Pittsburgh 30, Pa.

Remember that we also make USS COR-TEN*, USS TRI-TEN* and USS MAN-TEN* Steels . . . widely used in power generation equipment.

*Registered trademarks

USS United States Steel

NEW YORK

"An irregular-shaped hole being ground to within .0002" on the No. 2 Moore Jig Grinder. The machine can do contour grinding of almost any size and shape."—*from facilities booklet of August W. Holmberg & Co., Inc., Flushing, N. Y.*

MISSOURI

"Two No. 2 Moore Jig Borers...permit Ehrhardt to locate and bore holes accurately and to inspect the finished work."—*from facilities booklet of Ehrhardt Tool and Machine Co., St. Louis, Missouri.*

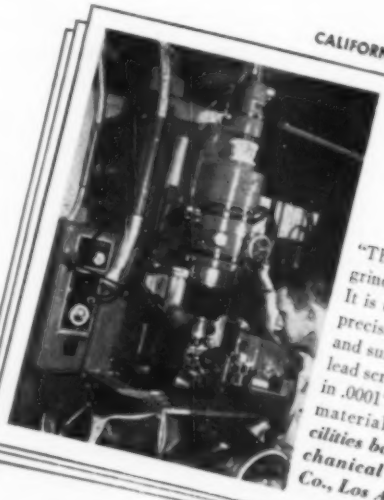
"FACILITIES, FACILITIES, FACILITIES..."

How Leading Tool and Die Shops Across the Nation Feature MOORE Jig Borers and Jig Grinders

Today, top contract tool and die shops often rely on illustrated booklets to sell prospects on their facilities. And they often rely on pictures of their Moore Jig Borers and Jig Grinders to indicate the degree of precision work they can do. It's particularly significant that leading contract shops choose Moore machines for "double duty"—in the toolroom and on the printed page—for these owner-managed firms are understandably deliberate and judicious in selecting machine tools. Write today for detailed bulletins on Moore's top-billed toolroom teammates.

MOORE SPECIAL TOOL COMPANY, INC.
738 Union Avenue, Bridgeport 7, Connecticut

CALIFORNIA



"This precision jig grinder is a Moore No. 2. It is used for producing precision holes, contours and surfaces to accurate lead screw settings within .0001" in heat-treated materials."—*from facilities booklet of Mechanical Specialties Co., Los Angeles, Cal.*

HOLES, CONTOURS AND SURFACES
Moore's *all-new* book tells you how to produce tools, dies and precision parts *the modern way*. 424 pages, 495 illustrations. $5 in U.S.A., $6 elsewhere.

ADD MOORE TOOLS TO YOUR TOOLROOM

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R B&W FASTENER BRIEFS

RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

Technical-ities

By John S. Davey

Select proper bolt diameter

An erroneous rule of thumb worth forgetting is that no bolt under ⅝" should be used where fastened members are under stress. Yet bolts ½-inch and smaller take plenty of external loading.

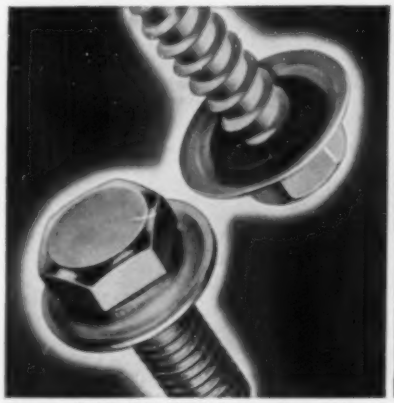
HOW TO LOOK AT IT

Primarily, you have to satisfy the stress requirements . . . the load. So select bolts on that same basis: the actual strength to sustain that load.

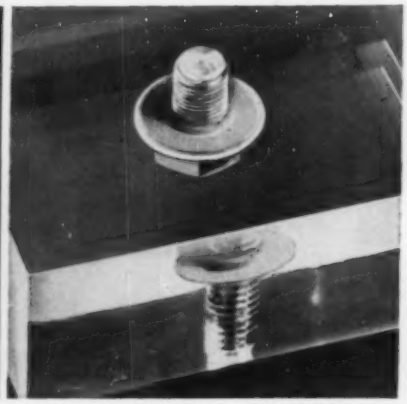
Calculating the strength requirements will tell you what bolt tensile, size, and number you need. If smaller bolts suffice, use them to avoid the penalty of overdesign. Holes can be smaller which means faster drilling and tapping. You have a chance to save materials since with smaller bolt holes, fastened members can often be made smaller too. You may also be able to standardize on a single size, saving assembly-line time.

SIZE VS. SAFETY

Remember that for a given grade of material, size tells you *capacity* of a bolt, not its *safety*. If you *tighten* a bolt to capacity, then you get safety. That's why a smaller bolt properly tightened is better and safer than a larger bolt sloppily tightened, especially where the loads are dynamic. Obviously, you reduce risk of under-torqued bolts as you reduce their size.



The new RB&W "SPIN SEAL" fasteners have spring-type washer with adhering flow-in seal . . . pre-assembled to standard machine or tapping screw.



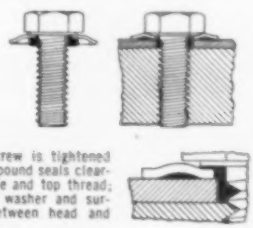
Flow-in sealant is confined by washer. Note how seal fills space under head and flows around and into threads in tightened SPIN-SEAL screw.

New SPIN-SEAL* screws give leakproof fastening

Here is a new type of composite fastener that seals by means of a unique flow-in sealant and washer.

ASSURES TRIPLE SEAL

Concave in shape, the heat treated springy washer confines and controls the flow of sealing compound. Tightening the screw forces sealant into various spaces around (1) threads, (2) head and (3) clearance hole to give hermetic sealing.



When screw is tightened the compound seals clearance hole and top thread; between washer and surface; between head and washer.

The washer has ability to conform to curved surfaces and still seal securely against hydrostatic pressures and wind driven water. Its spring tension and flat rim give the added advantage of dynamic metal to metal seal.

ONLY THE SCREW TURNS

Washer does not turn with the screw. This prevents twisting or tearing the sealing "gasket", marring of polished surfaces, or gouging of painted finishes.

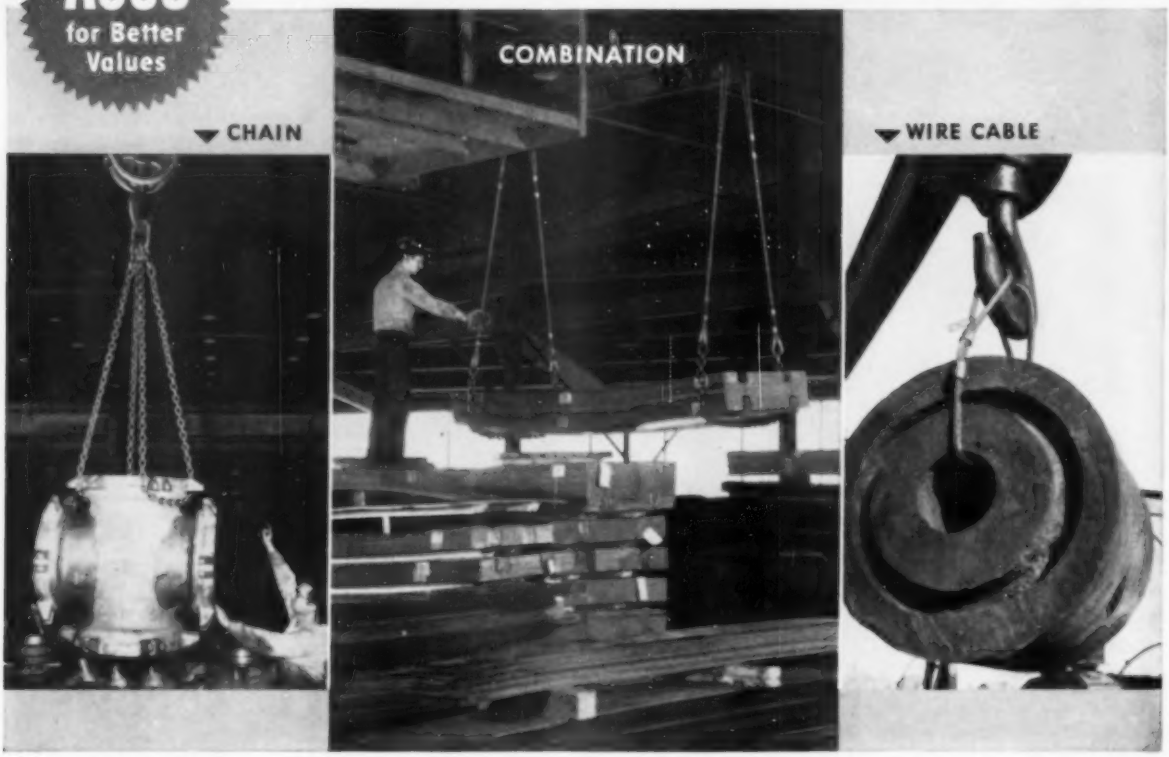
The flow-in gasketing compound is plastic rather than elastic. Stable and non aging, it won't split or ozone-check under pressure. It gives controlled flow into clearance spaces. Compounds are available to seal out water or oil.

Send for Bulletin SS-1 which gives details on RB&W "SPIN-SEAL" fasteners. Russell, Burdsall & Ward Bolt and Nut Company, Port Chester, N. Y. *T.M.

Plants at: Port Chester, N. Y.; Coraopolis, Pa.; Rock Falls, Ill.; Los Angeles, Calif. Additional sales offices at: Ardmore (Phila.), Pa.; Pittsburgh; Detroit; Chicago; Dallas; San Francisco.

ACCO for Better Values

Acco Registered® Slings—Chain and Cable



ACCO—your first source for any sling for any job

Whatever your sling requirements, there's an ACCO *Registered* Sling to do your particular lifting job in the safest, most economical way possible. Your rigger knows why certain slings should be used to lift certain types of loads, depending on varying factors of shape, weight, material and finish. Sometimes chain slings are necessary; other times cable; and on certain lifts a combination of chain and cable slings are best.

Because sling work requirements do vary from job to job, make certain that all your slings are precision-made under uniform conditions of quality control and pre-tested before they leave the factory. Only ACCO *Registered* Slings can give you this assurance...in the widest range of sizes and styles from any single source.

In addition, you get the latest technical improvements in ACCO *Registered* Slings. For example, there's the new shaped Master Link now available without extra charge on all ACCO *Registered* Slings. This new link, an exclusive development of ACCO engineers, gives 18% greater resistance to distortion with no increase in weight. Just one more quality bonus you get from ACCO *Registered* Slings.

Each of these slings is factory proof-tested at a load of no less than twice its rated capacity. Only after a sling has passed this rigorous test is it given the ACCO tag and certificate of registration.

Tell your distributor you prefer ACCO *Registered* Slings.

WHAT "ACCO REGISTERED" MEANS

1. The best material
2. Unit safety factor (on bodies, rings, links, hooks)
3. Proof test of complete sling to twice the working load limit
4. Actual field service test of each design
5. Metal identification ring or tag on each sling
6. Signed Registry Certificate with each sling

AMERICAN CHAIN & CABLE
BRIDGEPORT, CONN.

ACCO

Atlanta, Boston, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Odessa, Tex., Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Wilkes-Barre, Pa., York, Pa.
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Tools you can Trust
DISTRIBUTED BY
Men you can Trust
DIE STEEL
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Heller "Job Tempered" Tools

SUPERIOR CUTTING AT LOWER COST

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Hack Saw Blades

JOB TEMPERING MAKES THE DIFFERENCE!
Cross-rolled steel, produced to Heller's metallurgical specifications, has the right toughness and grain structure for your cutting requirements. Unique heat-treating methods, based on Heller's 121-years experience as a manufacturer of fine-cutting tools, give each blade uniform temper . . . for trouble-free cutting and longer life.

AMERICAN STANDARDS TESTING BUREAU AGREES!
This unbiased authority certifies that all Heller JOB TEMPERED Hack Saw Blades meet their standards for superior cutting: uniform teeth . . . uniform set . . . uniform temper.

YOU CAN TRUST YOUR HELLER DISTRIBUTOR TO DELIVER THE RIGHT BLADE!
This dependable source of cost-cutting tools carries Heller's complete line of Hack Saw Blades for both hand frames and power machines.

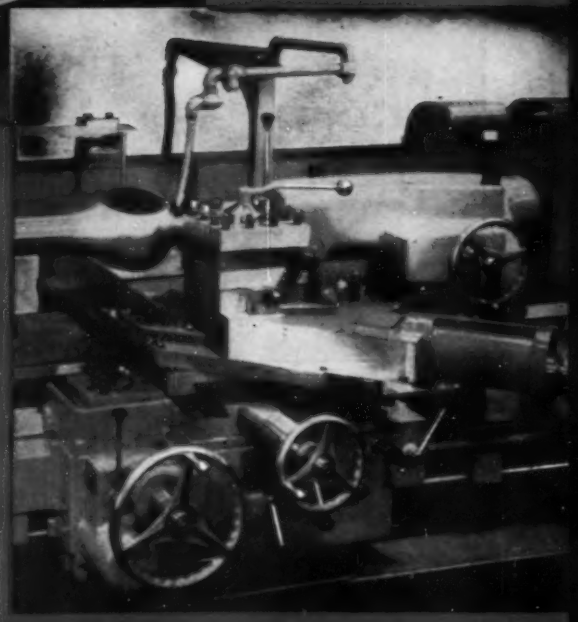
TOOLS YOU CAN TRUST
from
MEN YOU CAN TRUST

SERVICE + STOCKS = SAVINGS

HELLER TOOL CO.

America's Oldest File Manufacturer
NEWCOMERSTOWN, OHIO
Subsidiary of Simonds Saw and Steel Co.

2 hrs. versus 9½ hrs.



This marine Diesel engine connecting rod is now roughed and finished from the rough forging in exactly 2 hours. It formerly required 9½ hours to do the same job.

With production costs constantly reaching new peaks, industry simply can't afford to ignore such savings from modern equipment. Where else could such a magnificent return upon an investment be secured, and how else can costs be lowered to meet an increasingly competitive market?

More production per man hour is the answer and the only answer to prohibitive costs—modern, high production machinery is the answer to greater production per man hour.

The astounding saving on this connecting rod job is the result of transferring it from previous equipment to a new 32-inch "AMERICAN" Hydraulic Duplicating Lathe. Such savings as this are not the exception but the rule when "AMERICAN" Duplicators are put on the job.

Bulletin No. 35 shows many such examples—it's yours for the asking.

THE AMERICAN TOOL WORKS CO. **Cincinnati, Ohio U.S.A.**

Lathes and Radial Drills

JONES & LAMSON MACHINE TOOLS

the man who needs a new machine tool is already paying for it

Out-of-this-World Accuracy

Whether they're destined to go "out of this world" or not, many jobs demand some "out of this world" machining. Here's one, on a J & L lathe which is adapted for two-way tracing from the hexagon turret. Critical dimensions on both internal and external tapers, plus several intricate contours are finish-machined in one chucking.

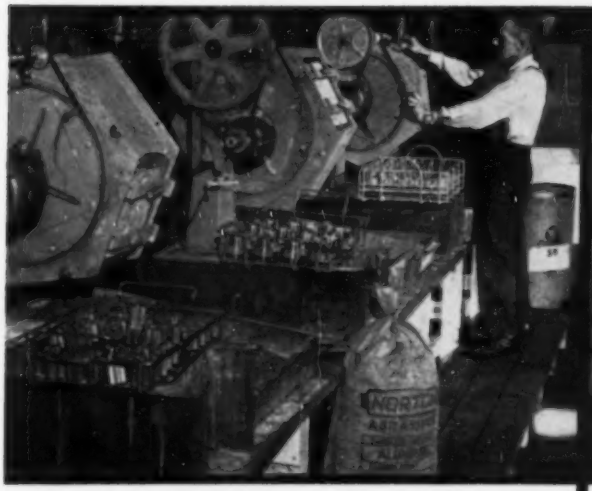
A three-way indexing template holder is push-button controlled. Thus, down-time for template changes is eliminated, and the 180° tracer continues to machine on both the forward and return feed of the saddle carriage.

A single selector switch disengages the tracing unit and the machine is ready for normal* turret lathe operations.

*("Normal" for J & L turret lathes means unsurpassed accuracy, high production, and low, low maintenance.) For details, write for our descriptive folder No. 5425. Jones & Lamson Machine Company, 502 Clinton St., Springfield, Vermont.

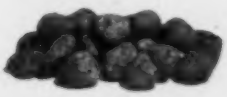
Turret Lathes • Fay Automatic Lathes • Precision Boring Machines • Thread & Form Grinders • Optical Comparators • Thread Tools

Money savers for all barrel finishing jobs



Small bench barrels with 7 cu. ft. capacity in production line operation. Alundum Tumblex "T" Abrasive is used for finishing irregular shapes.

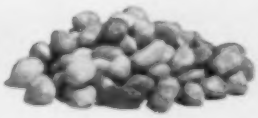
A 4 cu. ft. capacity production barrel being unloaded after finishing operation. Thirteen cu. ft. production barrel shown in left background.



ALUNDUM* TUMBLEX "A" Abrasive. For general barrel-finishing. Removes flash, scale, tool marks and burrs, while forming radii and finishes to required micro-inches. Seventeen sizes.

ALUNDUM TUMBLEX "T" Abrasive. Bonded, triangular and fast-cutting for special shaped parts. They won't wedge in work slots or holes. Four sizes.

ALUNDUM TUMBLEX "S" Abrasive. Bonded spheres that get into areas where other shapes can't reach. Exceptionally dense and long lasting. Five sizes.



TUMBLEX "N" Abrasive. Natural stones, exclusively Norton. For high lustre, especially on die castings and soft metal. Rounded shape brings up highest lustre. Seven sizes.

For finishing any part . . . in any barrel, large or small . . . there's an exactly right type and size of Norton TUMBLEX abrasive*

For lower costs in deburring, descaling and finishing parts to close tolerances, be sure to choose:

- *The right barrel equipment, available in a wide range of types and sizes.*
- *The right Norton TUMBLEX abrasive — made in four entirely different types, each in many different sizes and each engineered to add the "Touch of Gold" that brings lustre and boosts profits in finishing the widest variety of parts.*

Send samples of parts you finish — large or small, simple or intricate to our Sample Processing Department. We'll barrel finish, return samples, and tell you exactly the methods and abrasives you need to improve product quality and cut costs.

NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

G338

NORTON
ABRASIVES
Making better products . . . to make your products better

NORTON PRODUCTS
Abrasives • Grinding Wheels • Grinding Machines
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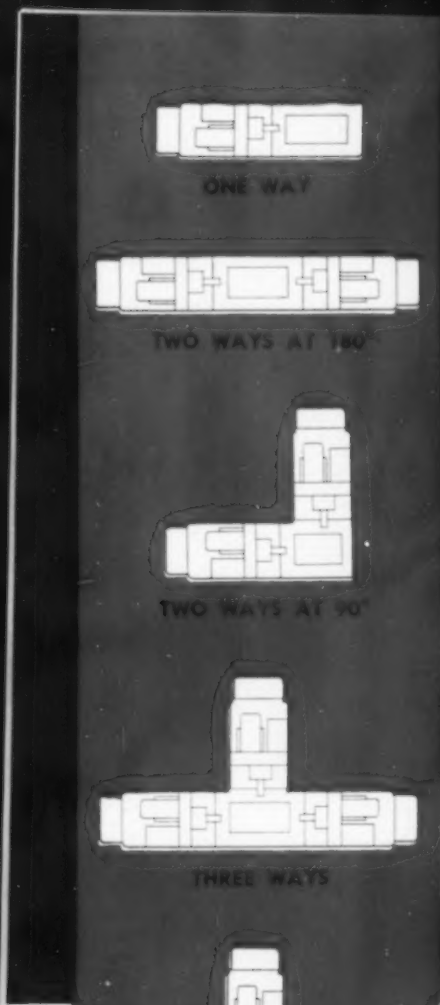
BEHR-MANNING DIVISION
Coated Abrasives • Sharpening Stones
Pressure-Sensitive Tapes



Ex-Cell-O 4-Way Machine precision bores four holes simultaneously, holding 90° angles.

7 ways to increase your production

Three new features on all Ex-Cell-O Way Machines give even greater production and precision

The diagrams at left tell a story.

Ex-Cell-O Way Machines using standard components in the combinations illustrated perform precision boring, turning, facing, grooving and chamfering operations economically and quickly. They take large work pieces in stride—the spindles move to the work.

In each machine three new features assure long life, dependable operation, and exceptional accuracy.

The features: (1) ways are hardened and ground, (2) slides are fully supported the length of the stroke, (3) hydraulic control panels give a wide range of automatic cycles.

Write Ex-Cell-O in Detroit for further information. Better still, call in an Ex-Cell-O representative.

EX-CELL-O CORPORATION

EX-CELL-O FOR PRECISION

XLO

DETROIT 32, MICHIGAN • Manufacturers of Precision Machine Tools • Grinding Spindles • Cutting Tools • Railroad Pins and Bushings • Drill Jig Bushings • Aircraft and Miscellaneous Production Parts • Dairy Equipment

56-44

HAYNES Alloys solve *tough* wear and corrosion problems

New Method

Eliminates maintenance on bearing area of shafts

After 17 months of grueling service in the sandy salt water of New York's harbor and surrounding waters, a tail shaft sleeved with a HAYNES wrought alloy at the outer bearing area showed only 0.015 in. wear. A bronze sleeve used in this same service wore over ¼ in. in 15 months.

This remarkable improvement in wear resistance was accomplished quickly and economically by the use of half sleeves made of HAYNES STELLITE alloy. Three sets of the half sleeves protected the bearing area of the shaft.

For more information on the many industrial applications for HAYNES STELLITE alloy half sleeves and bushings, ask for a copy of our free booklet. Write HAYNES STELLITE COMPANY, Division of Union Carbide Corporation, General Offices and Works, Kokomo, Indiana.

No Wear or Corrosion After 17 Months. Tug's tail shaft is removed for inspection of HAYNES STELLITE alloy sleeves at the outboard bearing area. The sleeved surface still has a mirror-like finish.

HAYNES ALLOYS

HAYNES STELLITE COMPANY

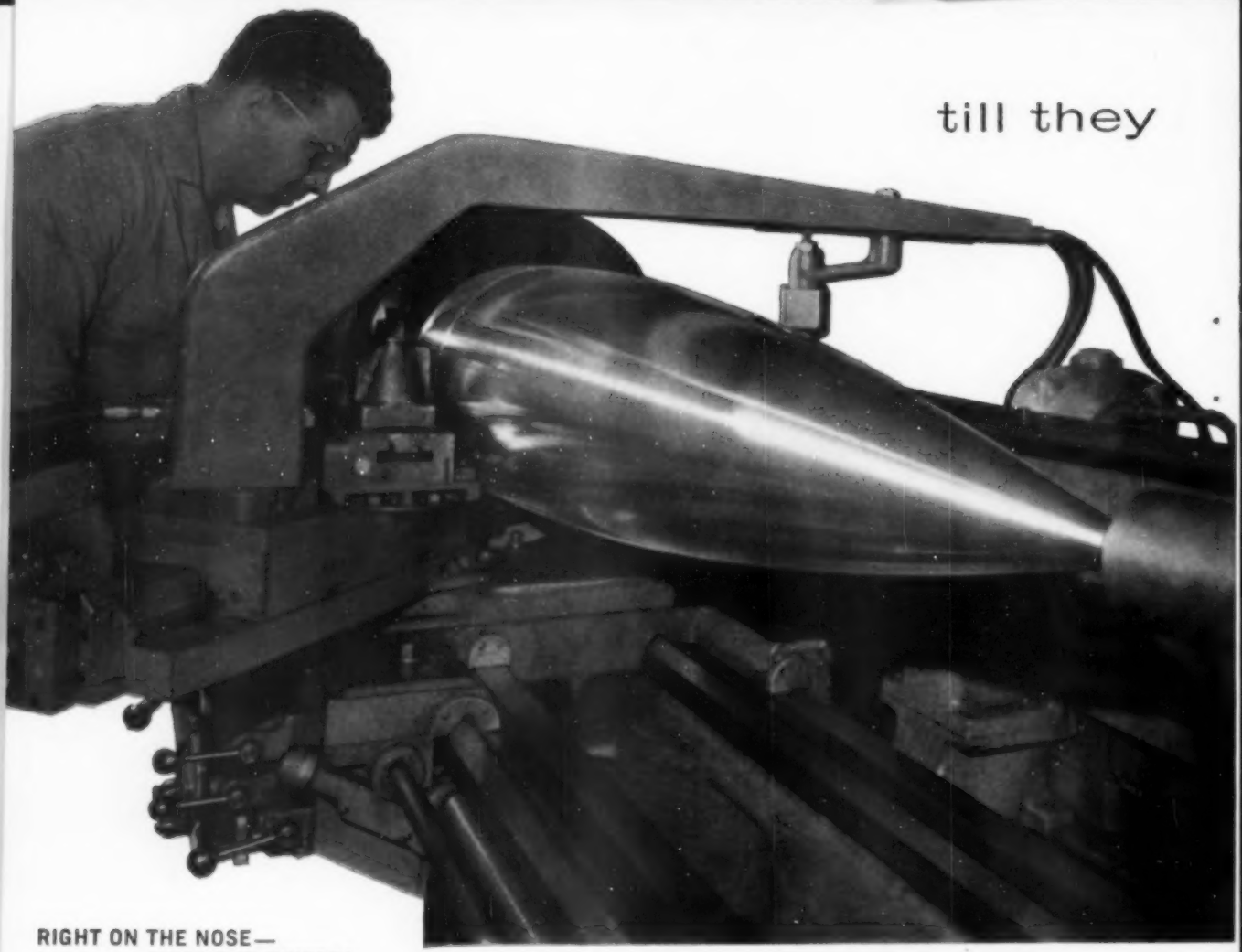
Division of Union Carbide Corporation

Kokomo, Indiana

UNION CARBIDE

"Haynes," "Haynes Stellite" and "Union Carbide" are trade-marks of Union Carbide Corporation

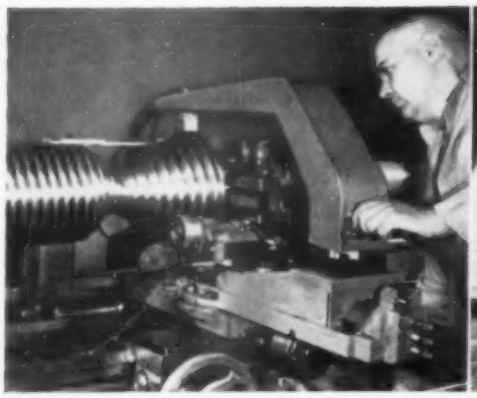
till they



**RIGHT ON THE NOSE—
AND EVERYWHERE!**

Grinding complex missile shapes, in many cases, would be either costly, difficult, impossible or all three. Monarch Air-Gage Tracer users produce finishes of 17-18 micro-inches **regularly**—some of which are polished to 2-3 micro inches. Good enough—and no grinding problem! (Above—unretouched photo of die mold for plastic nose cone turned to a 16-18 micro-inch finish)

Monarch
TURNING MACHINES
FOR A GOOD TURN FASTER . . . TURN TO MONARCH



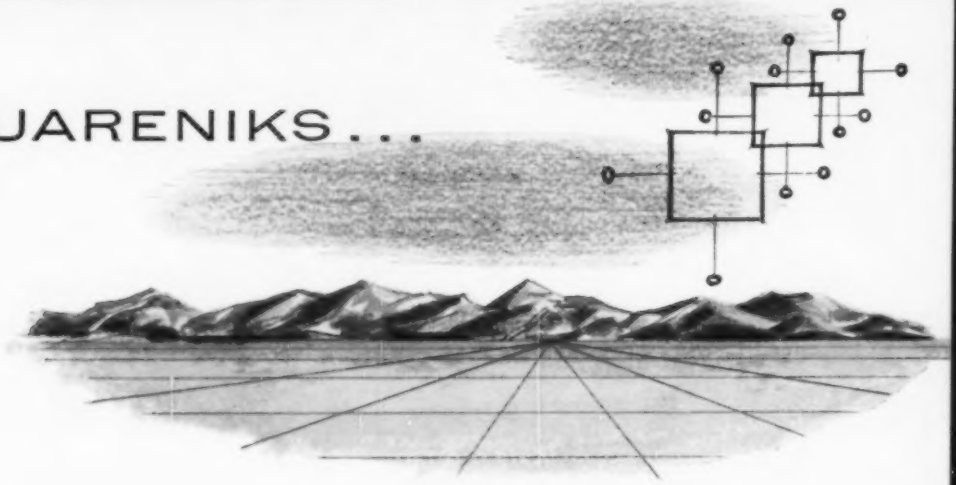
WHAT IT TAKES:

Air-Gage Tracer Control, Swiveling Action—a Monarch exclusive. Only with this equipment can you generate—in a single machining set up—the exacting, complex, often exceedingly thin-walled contours demanded by missile hardware. Tracer-controlled single point turning is mandatory for accuracy needed for critical parallelism, squareness and concentricity—and cheaper, too! (above a helix combustion chamber)

GREAT ON THE FACE OF IT

Numerous Monarch lathes afford you the advantages of constant surface cutting speed—so important to speed and finish in the facing of large, thin-walled work. Shown is a facing operation on a ram-jet turbine disc. Machine is a Monarch Model F Right Angle Lathe, swinging 60" in gap, equipped with Air-Gage Tracer Controls and constant surface cutting speed operating on both sides of center.

want SQUARENIKS...



THE MONARCH SWIVELING AIR-GAGE TRACER

is a missile and rocket making "must"

"Many jobs can be performed satisfactorily only on Monarch swiveling Air-Gage Tracer lathes," says one of the country's leading experts in the field.

Today, missile manufacturing is in its infancy. Even so, Monarch tracer lathes have proved themselves wherever used. And that is in most plants where missile components are being produced. Both swiveling and rigid types are employed. Adaptable to such work are all sizes from the small 10" Model EE to the largest Heavy Duty Lathes, plus the Mona-Matics and the Right Angle Lathe.

Profit by the experience of others. Check the applications pictured and described below. Then ask us for the whole story. Finally, remember we are talking about the same Air-Gage Tracer that is improving production and lowering costs in thousands of plants throughout metal working.

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

SELF-GAGING TURNING!

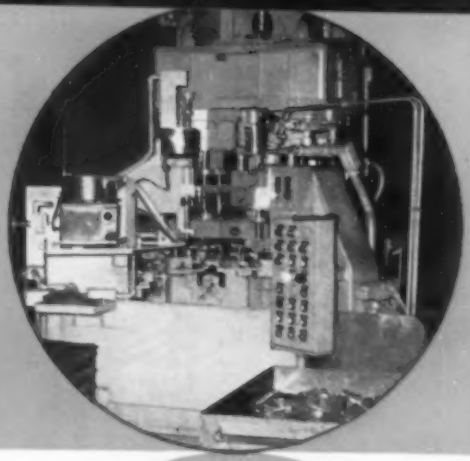
This rocket propellant chamber component is simple compared to some shapes. How's to gage them? Even expensive gaging fixtures can't always fill the bill. So what? With the close repetitive accuracy of Monarch Air-Gage Tracing, intricate parts are accepted based on the accuracy of the flat template used. Light (6-8 oz.) stylus pressure precludes template wear.

MULTI-THOUSAND DOLLAR QUESTIONS—AND EVERY ANSWER RIGHT!

What's to do when you spoil pieces in this business? Especially ones that might cost up in the thousands before machining (Not shown, but we've seen 'em!) Cut your throat? No—rely on the .0001" constant repetitive accuracy of your Air-Gage Tracer slide movement—**and don't spoil any!**

IT DON'T MEAN A THING IF IT AIN'T GOT THAT SWING

You need size in this business now—and they're designing bigger all the time. That extra-large work can be Air-Gage Traced overall on a Monarch. The turbine housing above is a typical example. But we're not stopping here. **If present Monarch sizes don't meet your actual anticipated needs, let us talk over greater swing designs with you.**



Two sizes of motor end-plates are assembled, bored, drilled and tapped in a Natco 3-Way Machine.

At Wagner Electric Corporation

One Natco

NATCO

Assembles, Bores, Drills and Taps... Reduces Labor Cost 70% On Small Motor End-Plates

This Natco combination assembly and multi-drilling machine presses a bearing sleeve into the end-plate, rough and finish bores the outside bearing-cap hole, drills an oiler hole at an angle, drills four (4) thru-bolt holes, and drills and taps two (2) 8x32 cover plate holes. *Production is 170 pieces per hour.*

This Natco accommodates two sizes of motor end-plates without changes in the basic rotary-table tooling. In addition to this important versatility the engineers at Wagner Electric point out these other advantages:

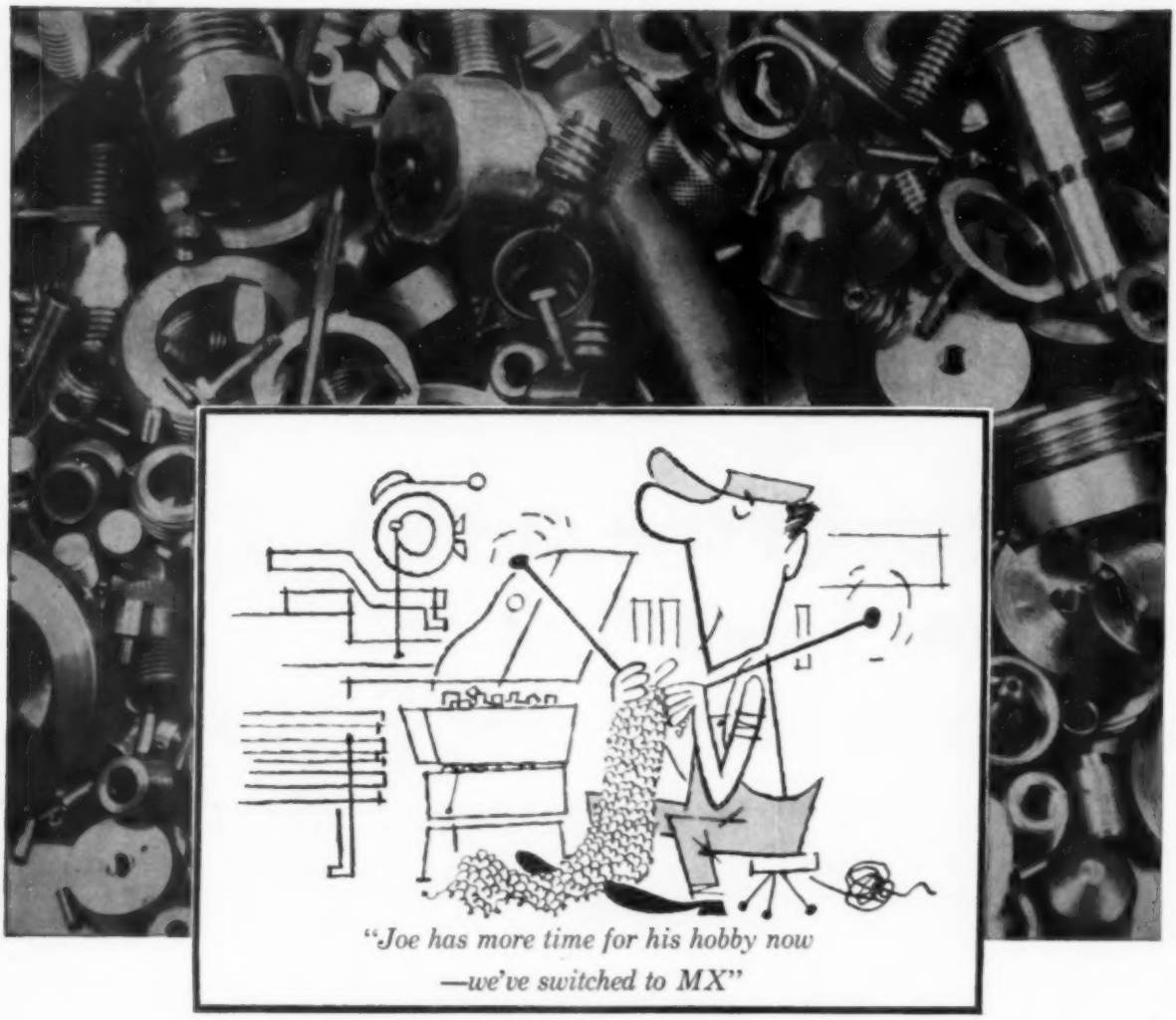
- *one operator* controls the assembly and machining from one station.
- *work scheduling* is simplified due to the short machine cycle.
- *in-process inventory* can be kept at a minimum because of high production rate.
- *floor space* is made available for other operations.

Natcos perform all kinds of drilling, boring, facing and tapping jobs in every conceivable combination and sequence.

Ask the Natco Field Engineer about the newly perfected tape control systems for Natco production tools.

National Automatic Tool Company, Inc.

Richmond, Indiana ***Multi-spindle drilling, boring and tapping machines. Special machines for automatic production. Call Natco Offices in Chicago, Detroit, New York, Buffalo, Philadelphia, Cleveland, Los Angeles; distributors in other cities.***



"Joe has more time for his hobby now —we've switched to MX"

It's surprising what a difference USS Free-Machining MX Steel can make. Parts come off the machine faster—tools last longer—there's less down time—rejects are practically eliminated.

No wonder that hundreds of shops, where this high-speed, fast-cutting bar stock has been put to work, report substantial *cost savings.* These savings average between 10 and 15%; in some cases have run as high as 42%. With MX they're not only getting more parts per hour but better parts—more accurate and of finer finish—at lower cost per part.

Why not switch to USS Free-Machining MX? *It costs no more than regular screw stock,* yet it has been successfully machined at speeds up to 350 SFM—speeds far higher than the average (under 250 SFM) used in most shops today.

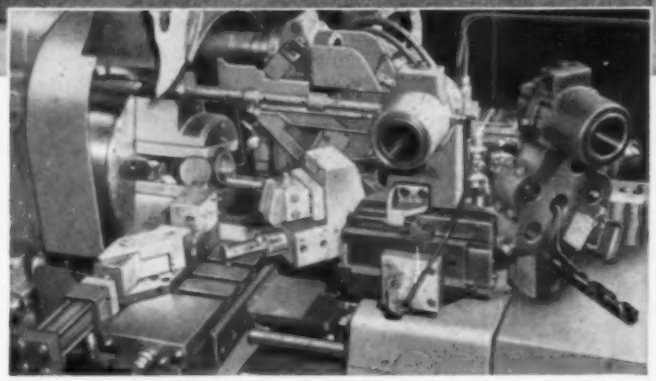
Production-boosting, cost-reducing MX steel is produced in all the popular screw stock sizes. It is available in both Bessemer and Open Hearth grades. You can obtain it in cold-finished form from your regular supplier, either as "MX" or under his own identifying trade name. In hot-rolled form, MX is available through our nearest sales office.

UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION
WAREHOUSE DISTRIBUTORS, COAST-TO-COAST
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Bigger output . . . longer tool life . . . lower costs

USS *—when you do the job with free-machining* **MX**

UNITED STATES STEEL



Edward Valves Div. cuts setup time on valve bodies

takes advantage of electric setup control panel, octagonal turret, JETracer on Gisholt Fastermatic

You may spot production ideas in the way Edward Valves Division of Rockwell Manufacturing Company, East Chicago, Indiana, is increasing production of $1\frac{1}{2}$" steel Univalve bodies.

A new Gisholt MASTERLINE 2F Fastermatic Automatic Turret Lathe is doing the job. With the Fastermatic's electric setup control panel, the operator preselects all important machine functions—including low spindle speeds for forming and threading, and high speeds for other operations. And with the Gisholt JETracer slide tool mounted on an 8-sided turret, a maximum number of surfaces are machined in a single chucking—with greater accuracy, finer finish and with more consistent quality.

Parts are held in an 18" 2-jaw hydraulically operated chuck. Automatic positioning at the end of each cycle speeds loading and unloading. Once the automatic cycle starts, turret tools drill, turn, face, form, relieve, chamfer, bore and thread. Cross slide tools face and chamfer. Critical internal diameters are finished to a high degree of accuracy, using turret-mounted JETracer slide tool.

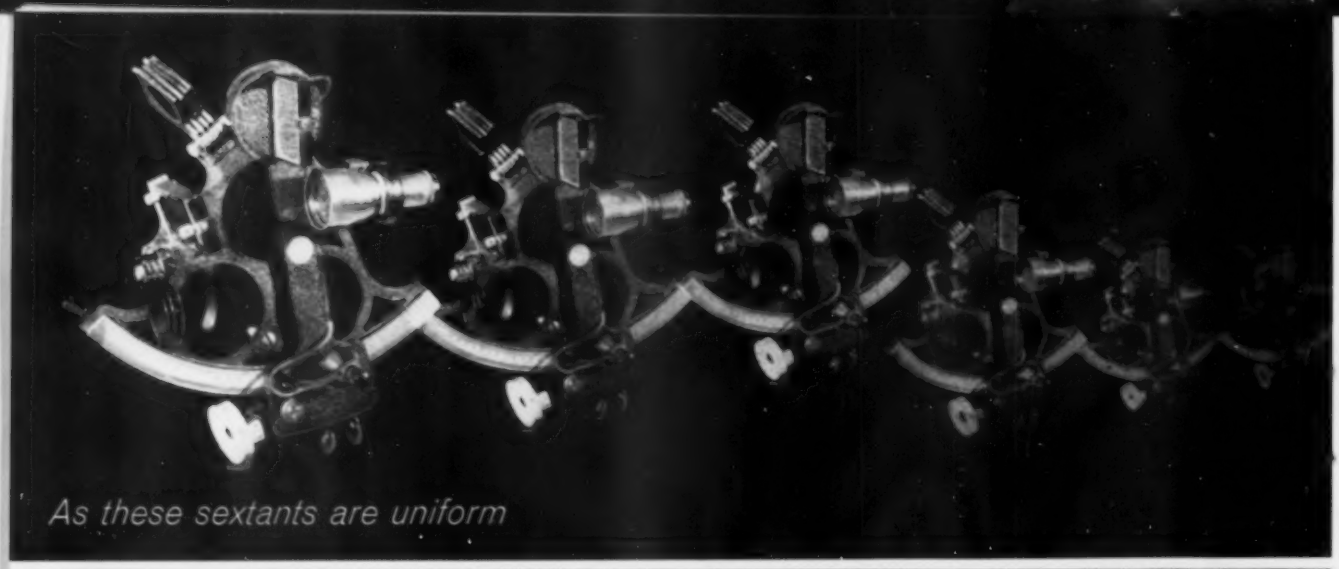
Like to hear the facts on how the Fastermatic lets you utilize smart tooling...eliminate human errors...get record production on long runs, automatic cycle operating advantages on short runs? Contact your Gisholt Representative. He has the facts, and his wide experience may suggest new methods to improve your profit picture.

MASTERLINE GISHOLT SINCE 1887 GISHOLT

GISHOLT MACHINE COMPANY
Madison 10, Wisconsin, U.S.A.

WRITE GISHOLT TODAY for advance data on the new Gisholt MASTERLINE Fastermatic Automatic Turret Lathe. Ask for Bulletin No. 1179.

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY REBUILT MACHINES WITH NEW MACHINE GUARANTEE



As these sextants are uniform

. . . So Card pipe taps are uniform, too

Your production's consistent ...because Card taps are uniform

Your first step in consistent production performance is the cutting tool itself. Because Card pipe taps are identical they keep production up to par — and predictable. Shopmen know about the uniformity of Card taps. Card gages are like that, too. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

CARD

DIVISION OF UNION TWIST DRILL COMPANY

— Serving you through the best distributors from Coast to Coast

If you use end mills as fast as welders use welding rods...

This brand cuts down your end mill usage, production time and costs!

The more you use end mills the more you need Union

Union end mills have the uniform top quality that gives you lower costs per piece produced — more production volume per end mill. Union also manufactures drills, milling cutters, gear cutters, reamers, hobs, carbide tools and inserted blade cutters of the same uniform top quality. **Available nationally through Union Distributors** and stocked in Union warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City and San Francisco.

UTD

UNION

TWIST DRILL COMPANY, Athol, Massachusetts

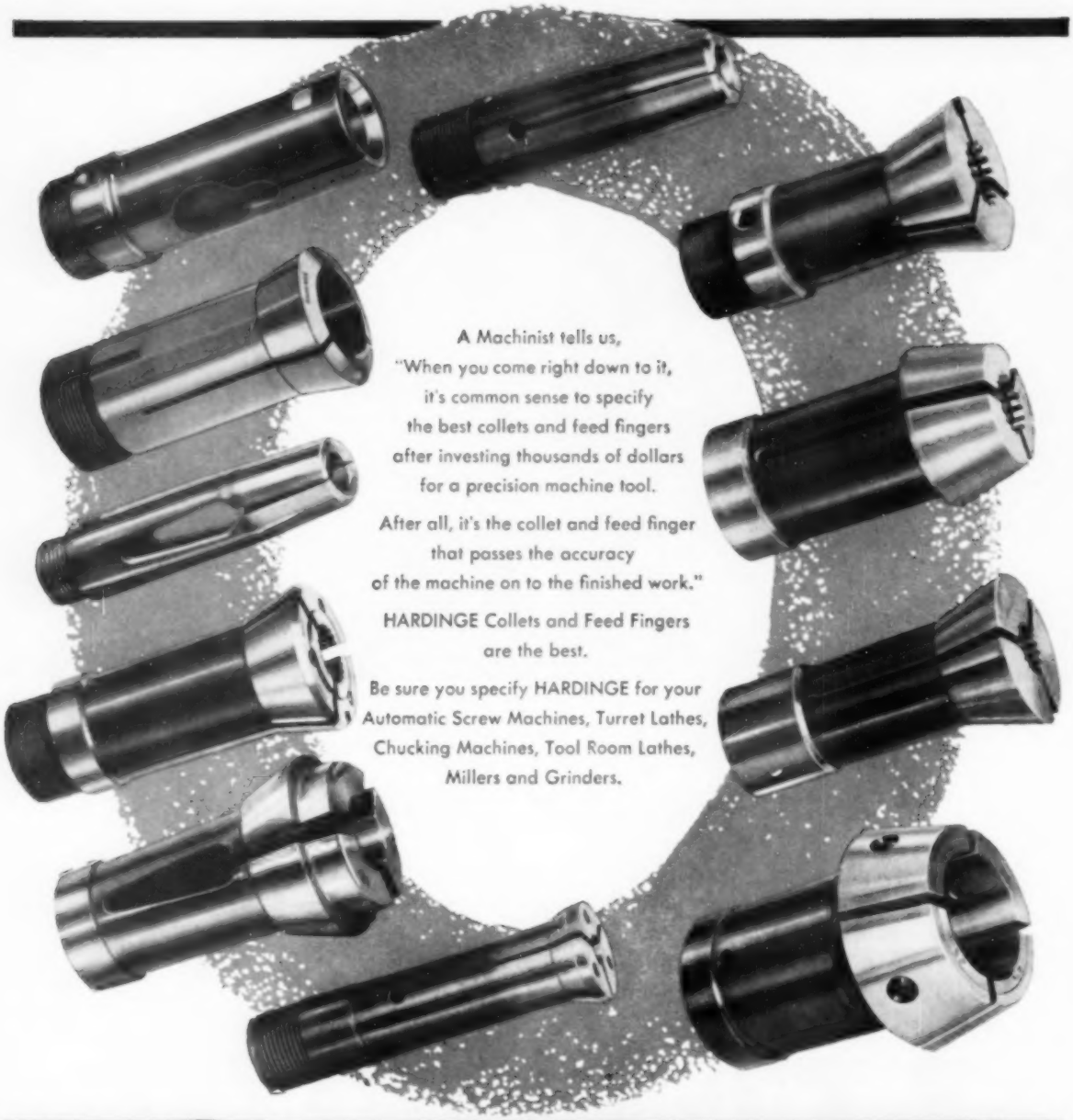
S. W. CARD DIVISION, Mansfield, Mass.; BUTTERFIELD DIVISION, Derby Line, Vt.

See Your UNION DISTRIBUTOR for cutting tools that will save you time and money

Specify HARDINGE ELMIRA, N.Y.

Collets and Feed Fingers

and *Get the MOST from your Investment in Machine Tools*

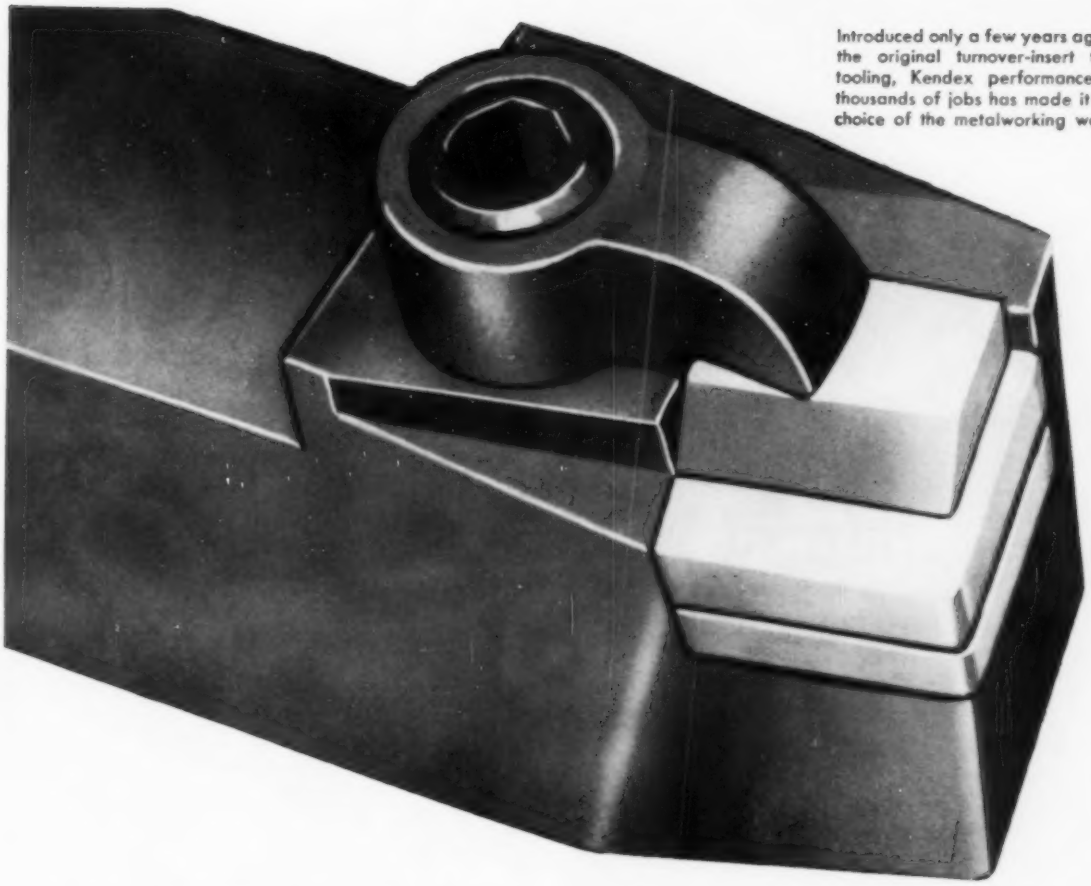


A Machinist tells us,
"When you come right down to it,
it's common sense to specify
the best collets and feed fingers
after investing thousands of dollars
for a precision machine tool.
After all, it's the collet and feed finger
that passes the accuracy
of the machine on to the finished work."
HARDINGE Collets and Feed Fingers
are the best.
Be sure you specify HARDINGE for your
Automatic Screw Machines, Turret Lathes,
Chucking Machines, Tool Room Lathes,
Millers and Grinders.

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Immediate stock delivery from Elmira, Boston, Atlanta, New York, Hartford, Philadelphia, Rochester, Dayton, Detroit, Minneapolis, Chicago, St. Louis, Oakland, Los Angeles, Toronto, Montreal.



Introduced only a few years ago as the original turnover-insert type tooling, Kendex performance on thousands of jobs has made it first choice of the metalworking world.

The KENDEX* Story...from drawing board to world-wide use in four years

Originally introduced in only seven styles, Kendex turnover insert tooling is now available in 42 styles and 222 holders—made in four countries† and sold world-wide. Such spectacular acceptance means that Kendex tooling is correct in design, sound in construction and is being used profitably on thousands of operations.

Further proof of the economical soundness of the Kendex design was its application to Heavy Duty and Positive Rake tools and recently to Encased Boring Bars and Boring Heads. Simplicity . . . to minimize the number of parts and avoid any complex parts . . . has been a keynote in designing Kendex Tooling. Simplicity with rugged construction; solid Kennametal chipbreakers for positive chip control; a wide selection of inserts . . . features that have won world-wide acceptance.

Your Kennametal Tool Engineer will work with you in selecting the right Kendex tooling for your machining operations. Applying and servicing Kennametal Tooling and solving tough machining problems is his full-time job. Call him now, or write to KENNAMETAL INC., Latrobe, Pennsylvania, for the new catalog of Kendex tooling.

*Trademark †United States, Canada, Belgium, Italy

5126

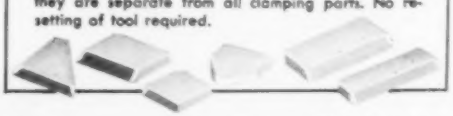
Features that have made Kendex the World's Leader in Tooling

Solid Kennametal Chipbreaker—Kendex Chipbreakers are "all carbide," as durable as the insert beneath . . . outlast several multi-edged inserts on average jobs; can be omitted when not needed or easily modified for special requirements.

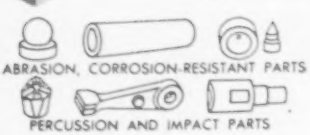
Economical Chip Control—Three standard chipbreaker widths fit both R.H. and L.H. holders, and take care of most jobs. Simple design provides most economical chip control ever available.

Low Contour of Kendex Chipbreakers minimizes chip interference . . . their snug fit leaves no gaps or pockets in which chips can jam.

Fast Setup—Kendex Chipbreakers and Inserts can be quickly indexed or replaced economically—as they are separate from all clamping parts. No resetting of tool required.



INDUSTRY AND
KENNAMETAL
...Partners in Progress



This shows one of 34 holes being tapped in the ram body for a hydraulic servo that is part of the MB-3 autopilot installed in the F-100.

BATH
SPIRAL POINT
GROUND THREAD
TAP

for the best buy ...buy Bath

Another Bath Tap job well done!

Reduces cost per tapped hole for Minneapolis-Honeywell

HONEYWELL

At Minneapolis-Honeywell, Aeronautical Division, the production of tapped holes in intricate and expensive parts is an important requirement.

Honeywell engineers approached this problem from the viewpoint of "cost per tapped hole", the only sound evaluation of tap economy.

Bath engineers and the Bath distributor co-operated and Bath was selected as a major supplier. They accomplished a SUBSTANTIAL SAVINGS that not only reduced the cost per tapped hole — but also established a higher degree of operating performance.

Although you may not have these exacting requirements in tap procurement, or the volume production to make such a depth of inquiry feasible, Bath taps will prove most economical for you too, as demonstrated many times in high production plants.

JOHN BATH & CO., Inc.
22 Mann St., Worcester, Mass.

CYLINDRICAL AND THREAD GAGES · GROUND THREAD TAPS · INTERNAL MICROMETERS

to help you beat today's toughest competition . . .

BUHR and **SIDNEY** offer pace-setting exclusive features like these . . .

in your special automation machinery . . .

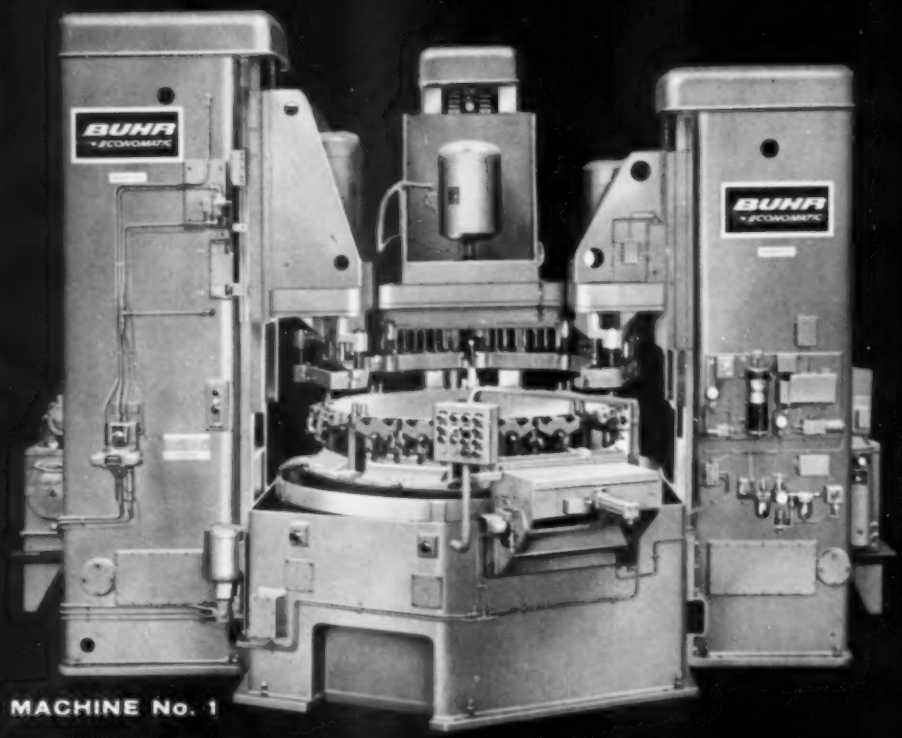
honed gears in multiple-spindle heads

BUHR • ECONOMATIC

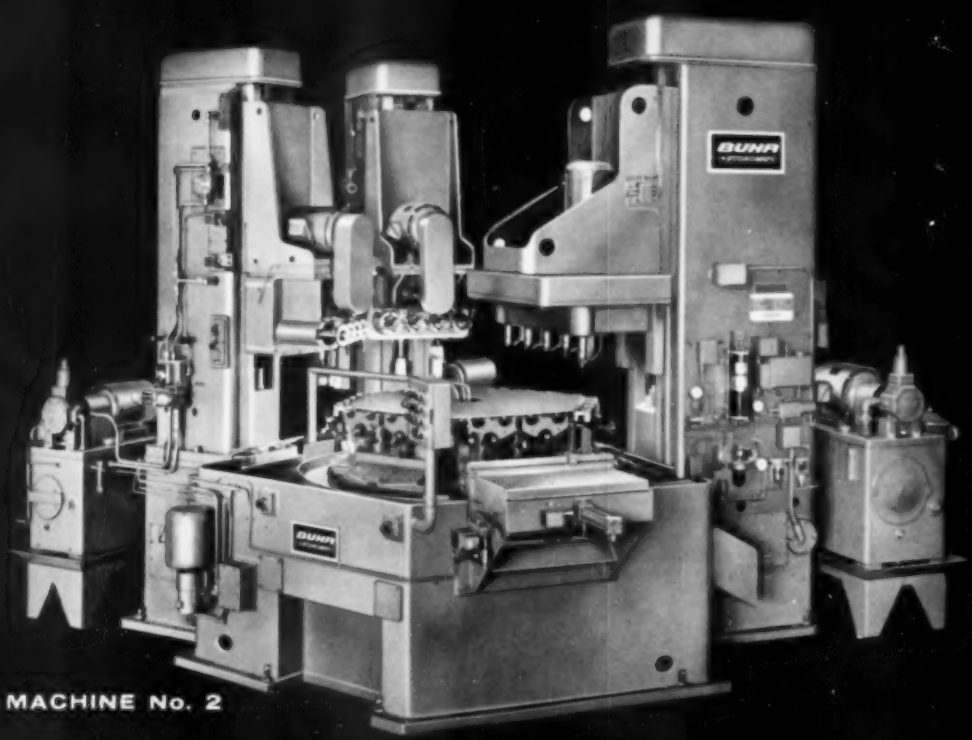
in your heavy-duty metal working lathes . . .

herringbone gears in headstock

SIDNEY



MACHINE No. 1



MACHINE No. 2

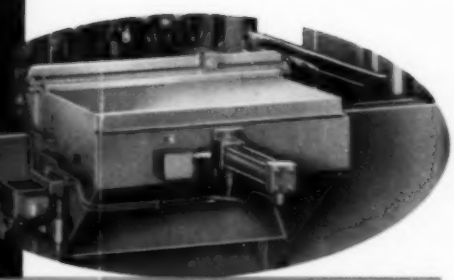
have out-performed competition by . . .

1 *month-in-month-out production record of one finished part each 4¼ seconds . . .*

2 *setting minimum production downtime records . . .*

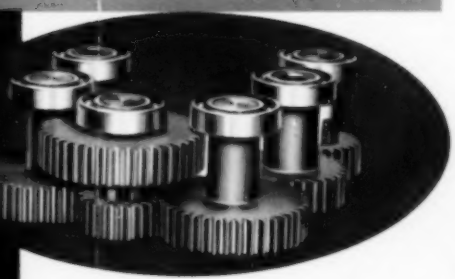
3 *record-breaking cost efficiency per part!*

two exclusive features why BUHR ECONOMATICS consistently set such records . . .



1 Automatic unloading of work piece—

Hydraulically-operated work-holding fixtures automatically unclamped . . . unloading device mechanically ejects parts, directing them to storage area.



2 Honed gears—

to provide smoother-running heads . . . lengthen gear life . . . reduce frictional loss in horsepower.

PART—AUTOMOTIVE CONNECTING ROD CAPS

ROUGH	MACHINE 1	MACHINE 2
	drill, chamfer, rough-ream and finish-ream bolt holes	mill and chamfer anchor slot and oil-passage groove

BUHR • ECONOMATIC

Symbol of Production Dependability

BUHR MACHINE TOOL CO.
ANN ARBOR, MICHIGAN
Solidly Engineered • Precision Built • for World's Leading Manufacturers

to help you beat today's toughest competition . . .

BUHR and **SIDNEY** offer

pace-setting exclusive features like these . . .

in your special automation machinery . . .

honed gears in multiple-spindle heads

BUHR ECONOMATIC

in your heavy-duty metal working lathes . . .

herringbone gears in headstock

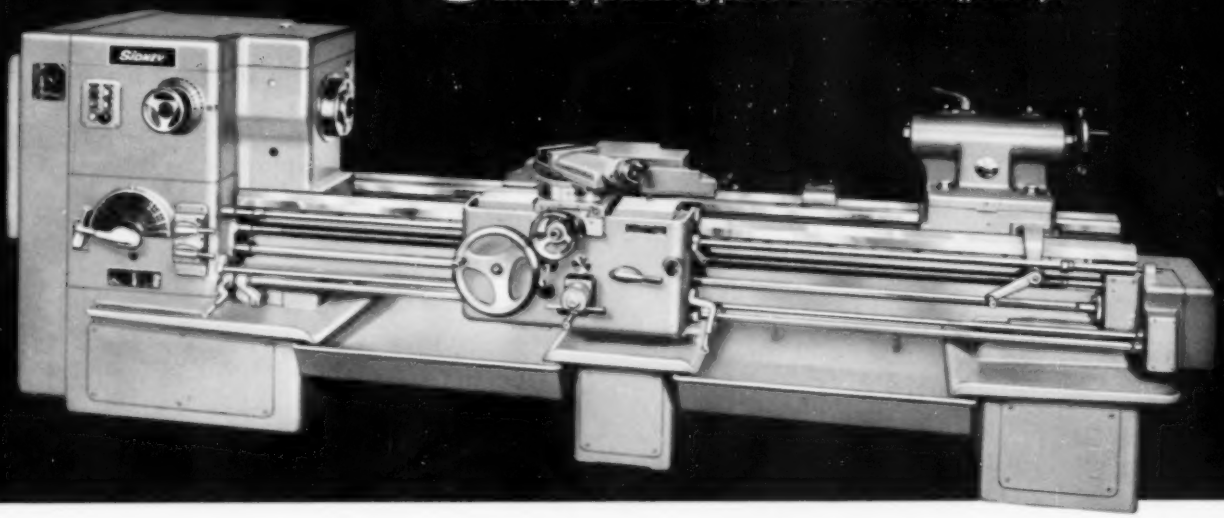
SIDNEY

SIDNEY LATHES can strengthen your competitive position by...

1 *machining more work per man-hour!...*

2 *continuing to set new records for minimum downtime!...*

3 *actually producing parts at record cost efficiency!*



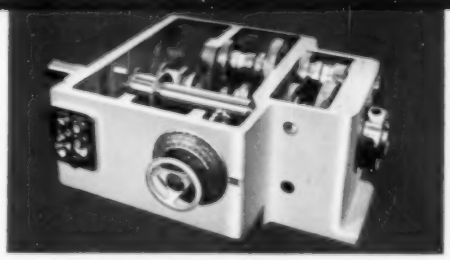
how Sidney Lathes accomplish this...

1 *by easier, quicker operations due to such* exclusive features *as Sidney Pre-Selective Spindle-Speeds...*

single direct-reading dial with 32 automatic speed-changes...

2 *by extra long-lasting basic construction such as Sidney's* exclusive *Herringbone-Geared Headstock...*

complete anti-friction bearing construction with automatic pressure lubrication...

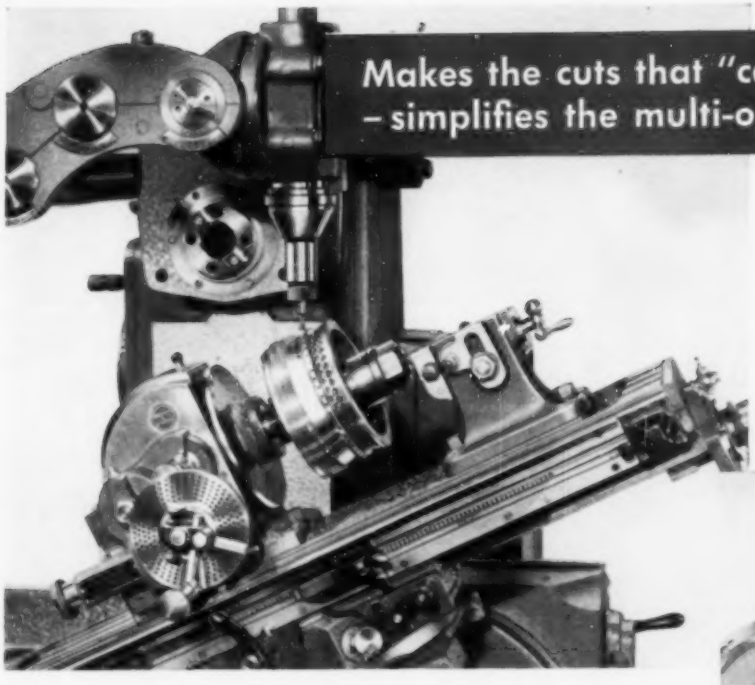


3 *by manufacturing methods and quality control which . . . on their record . . . have been the finest for dependable, efficient precision workmanship!*

To meet today's competition, investigate SIDNEY LATHES! Your phone call, wire or letter will bring a personal call and full particulars!

SIDNEY

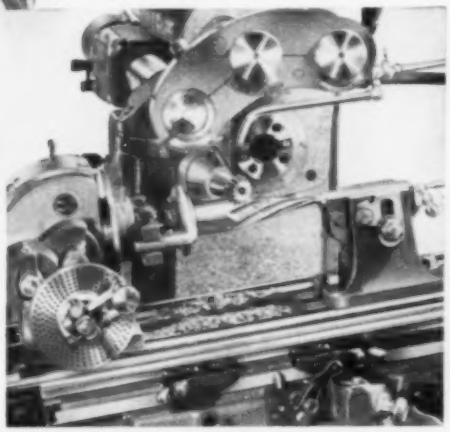
SIDNEY MACHINE TOOL CO.
SIDNEY, OHIO
Wholly owned subsidiary of Buhr Machine Tool Co.



Makes the cuts that "can't be done" – simplifies the multi-operation jobs.

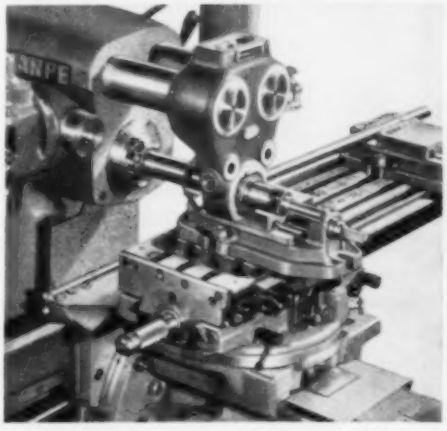
MILLING AT VARIOUS ANGLES WITHOUT RE-LOCATING WORK
Three series of evenly-spaced holes are milled in angular and horizontal surfaces, simply by swiveling the knee and positioning table to bring the work piece to the required position. Illustration shows the last row of holes being milled. No change was needed in the location of the work on the table.

CUTTING SPIRAL TAPER REAMER TEETH
The OMNIVERSAL **only** offers the required combination of motions and settings for many jobs like this.



ALL in the day's work
for the Brown & Sharpe OMNIVERSAL

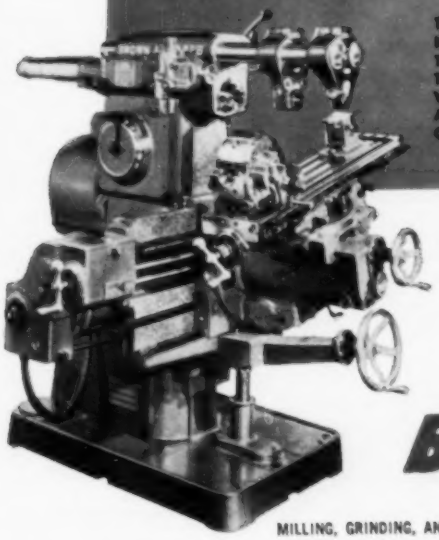
The OMNIVERSAL provides the flexibility, work-range, and precision to handle *all* the milling operations called for in multi-operation work, at big savings in set-up time and cost. Get full information . . . write: Brown & Sharpe Mfg. Co., Providence, R. I.



MILLING KEYWAY FULL 34" LENGTH of shaft. The exceptional longitudinal and vertical range of the OMNIVERSAL is another reason why its versatility is practically unlimited. Cuts up to 34" in length are made by combining feed of knee slide and table.

FOR TOOLROOM
experimental, and prototype work
No. 0 OMNIVERSAL Milling Machine

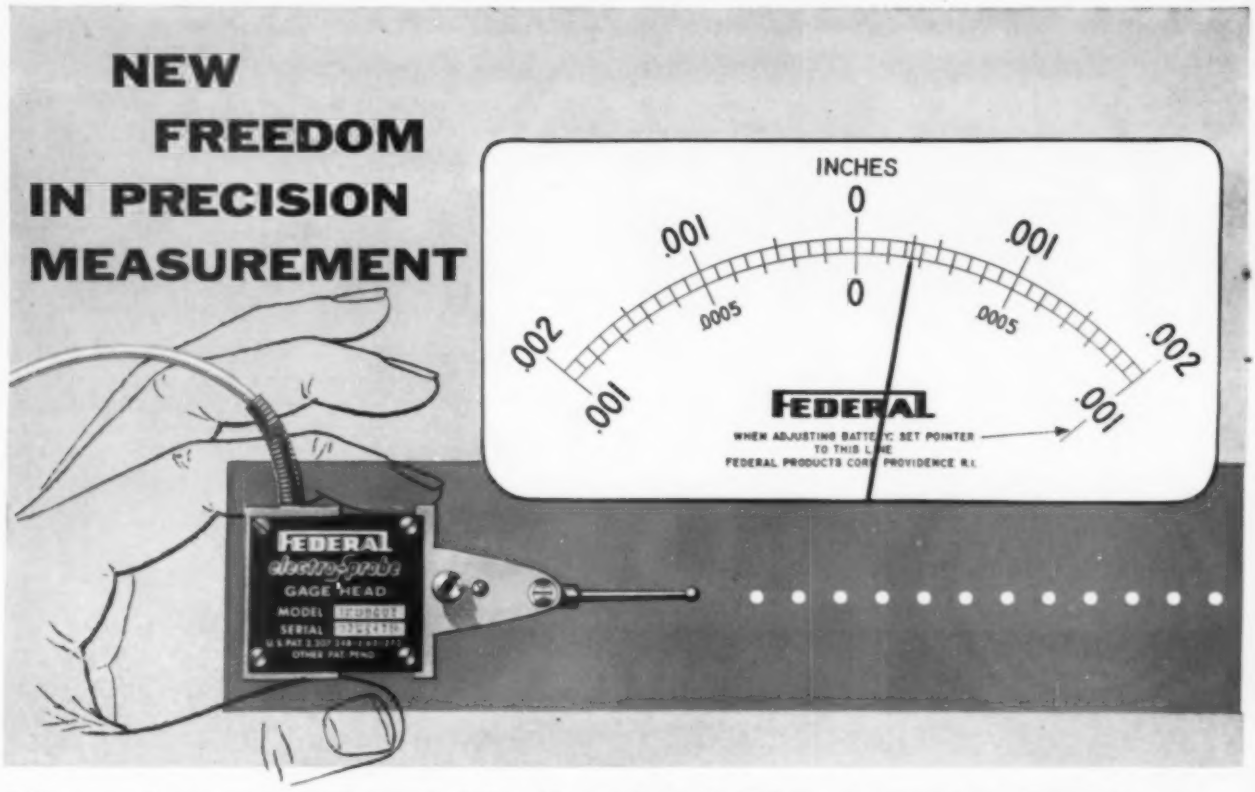
Table feed	17"
Knee slide feed	17"
Total horizontal feed	34"
Transverse feed	5½"
Vertical adjustment	15"
Axial hand feed of Omniversal Milling Head,	2"



PROGRESS IN PRECISION > *FOR 125 YEARS*

Brown & Sharpe > LBS

MILLING, GRINDING, AND SCREW MACHINES • MACHINE TOOL ACCESSORIES • PRECISION TOOLS • PUMPS • CUTTERS



New, Lower Cost Method of Electronic Gaging Promises New Horizons in Dimensional Control

as a system of measurement

The Electro-Probe system is one of far reaching capabilities . . . the gaging signal maintains exact linear relationship to contact movement — so exact, in fact, that available electrical instruments have not had sufficient sensitivity to measure the error. And this precision is available over the exceptionally wide range of .060". Mechanical and electrical sensitivity of the Electro-Probe is capable of providing magnifications and accuracies which will more than meet even *tomorrow's* precision gaging requirements. Small size and extremely light gaging pressure enable the gage head to reach and explore hitherto inaccessible surfaces. Hermetic sealing also allows you to use the Electro-Probe under conditions where electronic gaging has previously been impractical. Thus, the Electro-Probe has a challenging reserve of capability awaiting the need and means for its use. Perhaps you have an application that needs the Electro-Probe's advantages. We'll be glad to discuss it with you.

as a precision instrument

The first publicly announced application of the Electro-Probe system is the Model 230 P-2 Electronic Test Indicator described on the facing page. It is far more than just another electronic test indicator. No need for special stands or holding fixtures. No need for external power. No voltage fluctuation or warm-up problems. No need for close gage head positioning during set-up. The Electro-Probe frees you from these and other restrictions of use — truly provides you with a new freedom in precision measurement.

Ask **FEDERAL** *First*

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic — for Inspecting, Measuring, Sorting, or Automation Gaging

Surface Plate — Electro-Probe can be used accurately with any type of conventional test set.

Bench — Use the Electro-Probe on any suitable comparator.

Machine — The light contact pressure of the Electro-Probe makes machine set-ups easier and faster.

the electro-probe

1. TAKE IT ANYWHERE — The Model 230 P-2 Electro-Probe, a part of the new Electro-Probe System, is a completely portable, self-contained unit consisting of a bantam size electronic gage head and transistor amplifier which together with metal carrying case and accessories weighs only 8½ lbs. It is completely independent of external power. Gage head and output cord are impervious to oil and water in any amount (electrical parts are hermetically sealed).

2. MOUNT IT ON ANY CONVENTIONAL FIXTURE — The Electro-Probe gages accurately without requiring a special stand or holding fixture because it has the lightest positive gaging pressure (less than 5 grams). Posts and arms which would deflect even under normally light gaging pressures remain rigid when the Electro-Probe is used. And unlike other precision instruments, gaging pressure is constant throughout range (change is less than 0.1 gram per .001").

3. SET IT UP IN A JIFFY — The Electro-Probe gives you precision *without* the penalty of time-consuming, finicky adjustments. Master it anywhere within its range because Electro-Probe response is absolutely linear. Full scale Zero Adjustment makes positioning easy and fast. Also — unlike any other electrical gaging device, warm up time is virtually zero. Gage the part when *you're* ready, turn it on and off, as you like, without penalty.

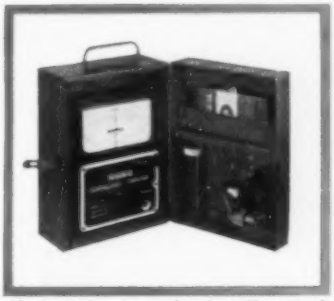
4. GAGE WITH EASE AND ASSURANCE — The Electro-Probe contact has friction-free travel of .060". It is clutch mounted so you can place head in almost any position — as well as to provide *complete* over-travel protection. Either of two magnifications instantly available by switching. Wide 4½" dial provides comfortably spaced, easy-to-read graduations. Knife-edged pointer permits sharply defined readings.

5. ENJOY GREATER RELIABILITY THAN EVER BEFORE — Use of printed circuits and transistors in Electro-Probe Amplifier means truly trouble-free operation. Connections are sure, operating current amazingly low, — no heating or voltage regulation problems, no dependence on electrical outlets. Learn more about this truly portable, reliable, accurate and versatile gaging device that gives you precision without the restrictions that precision has up to now imposed.

Write for literature

Federal Products Corporation, 7129 Eddy Street, Providence 1, R. I.

Packaged for Convenience

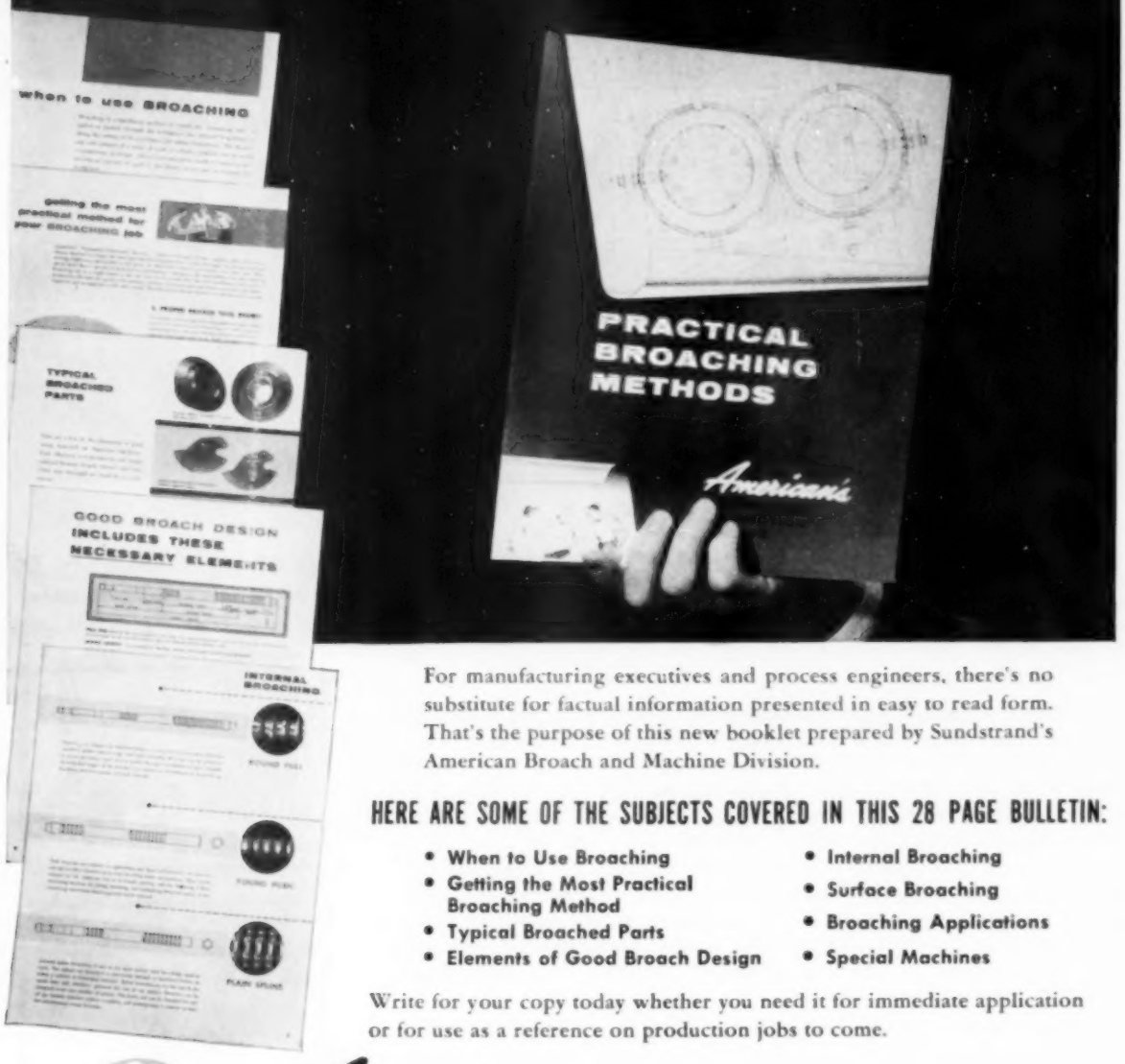


Electro-Probe gage head, self-powered amplifier, and accessories, all in one lightweight case.

. . . easily carried from job to job.

need BROACHING facts?

get them in American's new booklet



For manufacturing executives and process engineers, there's no substitute for factual information presented in easy to read form. That's the purpose of this new booklet prepared by Sundstrand's American Broach and Machine Division.

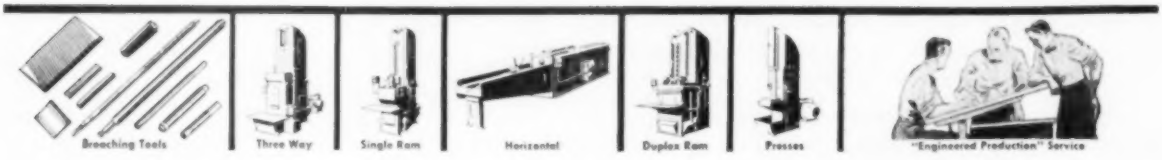
HERE ARE SOME OF THE SUBJECTS COVERED IN THIS 28 PAGE BULLETIN:

- When to Use Broaching
- Getting the Most Practical Broaching Method
- Typical Broached Parts
- Elements of Good Broach Design
- Internal Broaching
- Surface Broaching
- Broaching Applications
- Special Machines

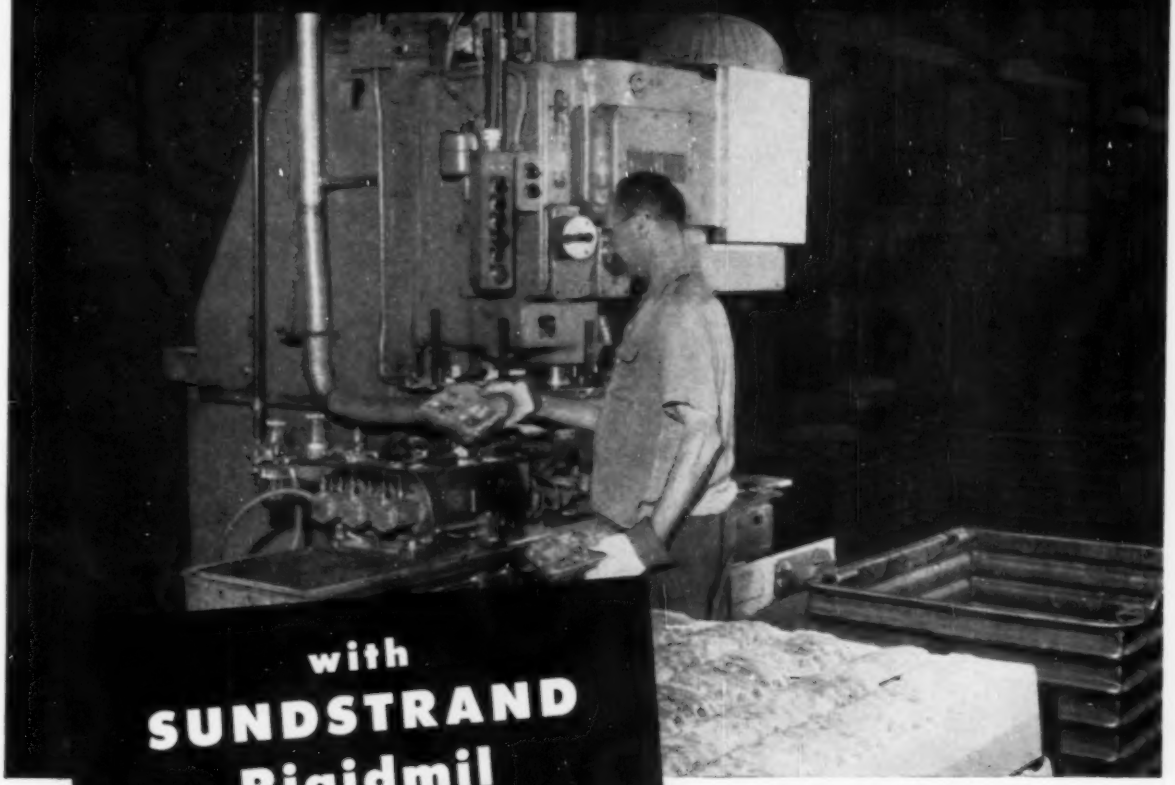
Write for your copy today whether you need it for immediate application or for use as a reference on production jobs to come.

SUNDSTRAND

American
BROACH & MACHINE DIVISION
SUNDSTRAND MACHINE TOOL CO.
ANN ARBOR, MICHIGAN



MILLING PRODUCTION TRIPLED



with SUNDSTRAND Rigidmil

A production jump from 365 to 1125 cylinder heads per eight-hour shift is the record set by this Sundstrand Vertical Rigidmil in the plant of a major builder of heavy duty air cooled engines. Not only was this sizable production increase effected by the change from former method of machining, but also the size tolerance is being held within .0002 inch during the face milling operation. Fixturing includes two workholders with hydraulic clamping permitting one station to be unloaded and loaded while the other is in milling position.

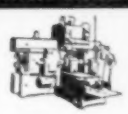
Performance like this is what you get by combining Sundstrand "Engineered Production" Service with advanced designs of standard, semi-standard, and special machines. Sundstrand's record of proved performance in hundreds of automotive, aircraft, farm equipment, railroad, and construction equipment plants insures that you'll get the most practical machining methods for your needs.

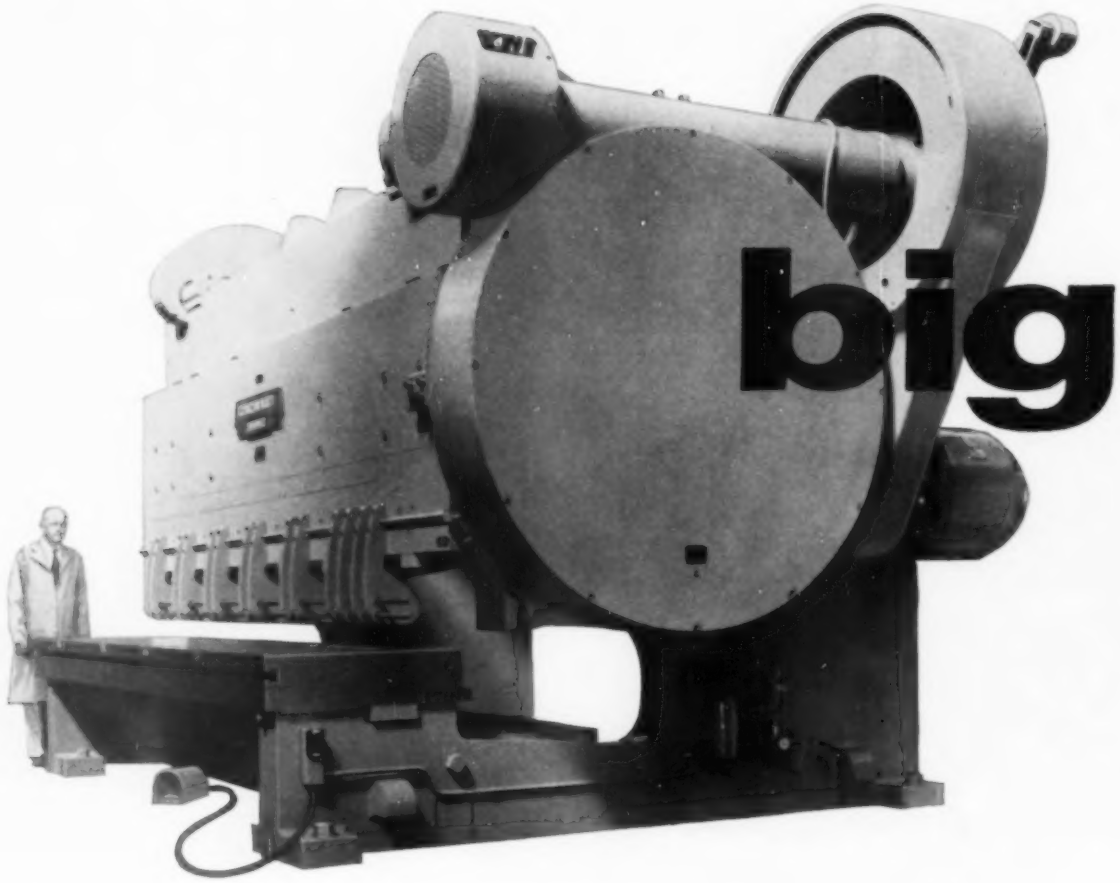
Write for Bulletin 188 describing C-Model Rigidmils, the newest development in production milling from Sundstrand.

SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U. S. A.

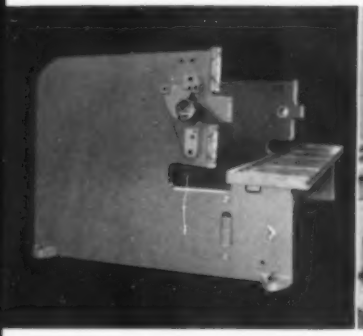
SUNDSTRAND "Engineered Production" Service

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS | TRIPLEX RIGIDMILS | SPECIAL MACHINES



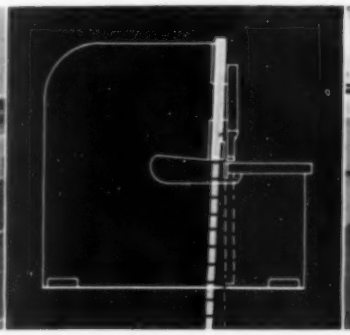


Typical Cincinnati Shears: **big** series 15012, capacity 1½", 12'; **small** series 1004, capacity 3/16", 4'; **in between** series 1810, capacity ¼", 10'.



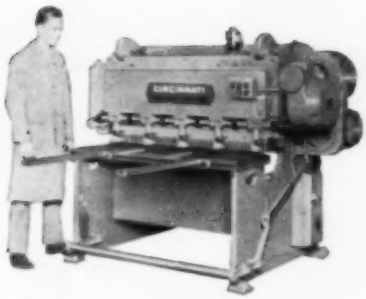
All steel, interlocked construction—no welds used as load supports

Hydraulic holddowns exert tons of pressure, insure accuracy

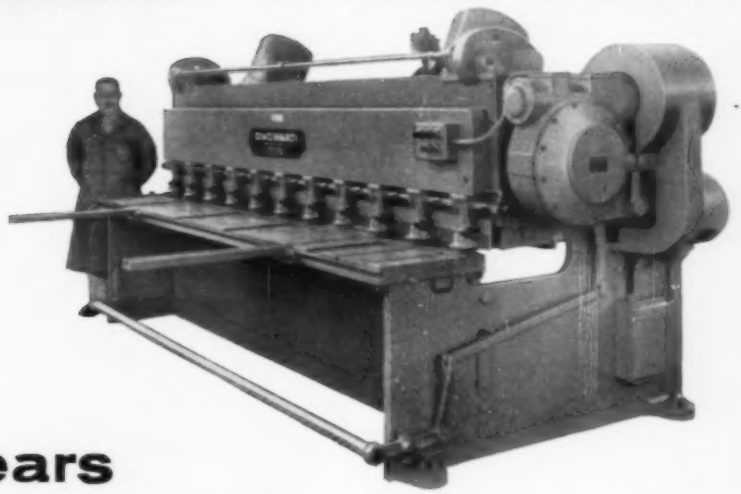


Non-float inclined ram maintains extremely accurate knife clearance

Front controlled power back gage is standard, accurate, convenient



small or in between



Cincinnati Shears give you every advantage

Simple operation, micrometer accuracy, cost-cutting speed, all-steel construction, and versatility—these are the advantages which make Cincinnati Shears earn their way in your plant.

And, whether you're shearing steel or plastics, nonferrous metals or asbestos, wire mesh, clad metals, or even radioactive material, the Cincinnati Shear line gives you a range of choices to fit your own requirements. Cincinnati Shears are in service cutting all of these materials.

Cincinnati ruggedness enables you to use one knife clearance for all thicknesses up to machine capacity.

Power operated back gages which are standard equipment, reduce non-productive time. Hydraulic holddowns provide tons of pressure, insure accuracy. The inclined ram permits the economy of four-edge knives, keeps work from binding between back gage and lower knife.

Since gap frames are standard, you can do notching, slitting or shearing work longer than the machine on any Cincinnati Shear to the limit of its gap.

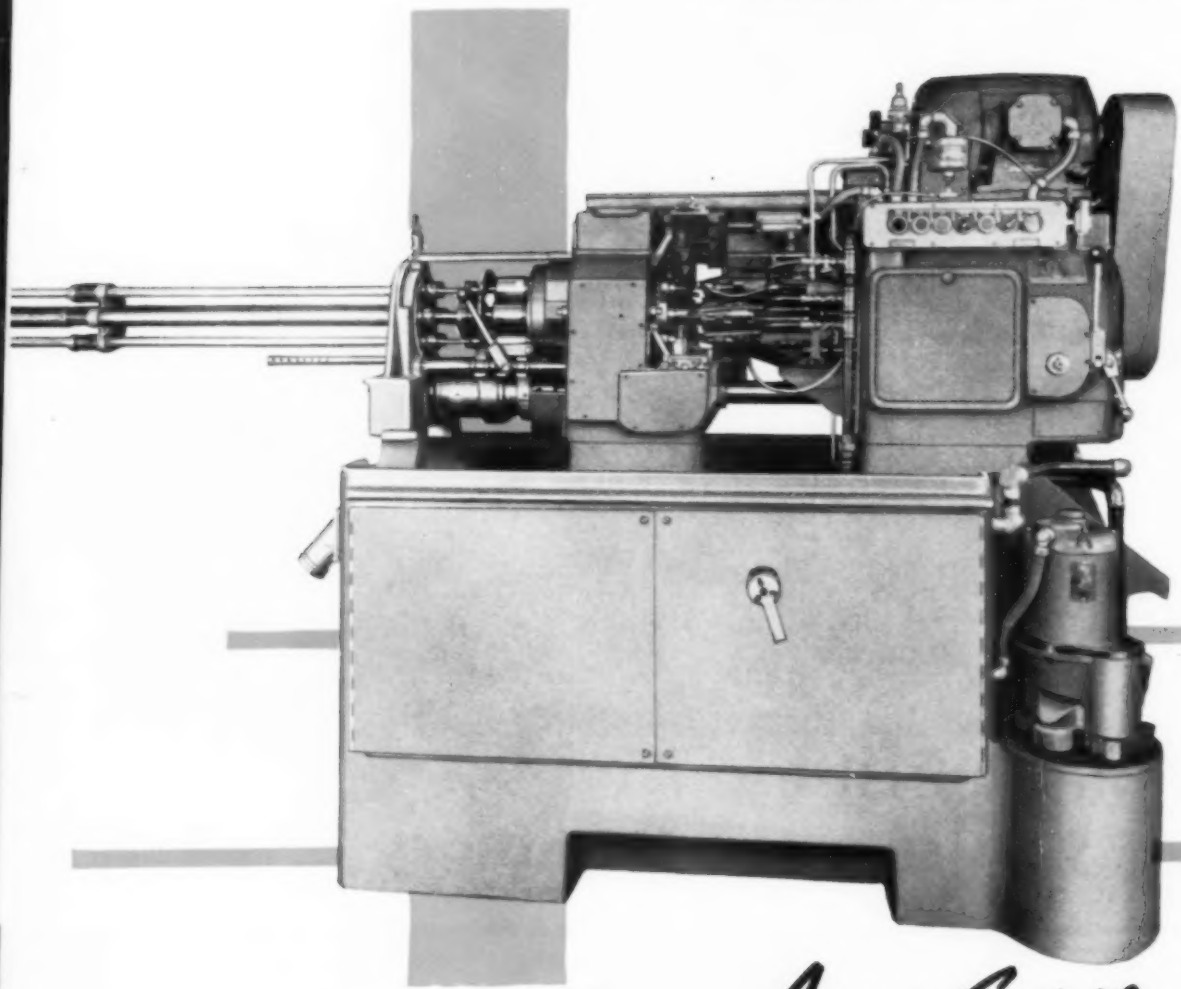
Be sure to get the full Cincinnati story before you buy your next shear. Write Dept. A for Catalog S-7R.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

NAMCO Standard Quick-change tooling available on . . . .



this all-new *Acme-Gridley* 7/16"-Six Spindle Bar Automatic gives you the lowest cost per piece.

HIGH PRODUCTION ACCURACY — sustained at highest speeds and feeds through proper weight distribution and support of toolholders without overhang.

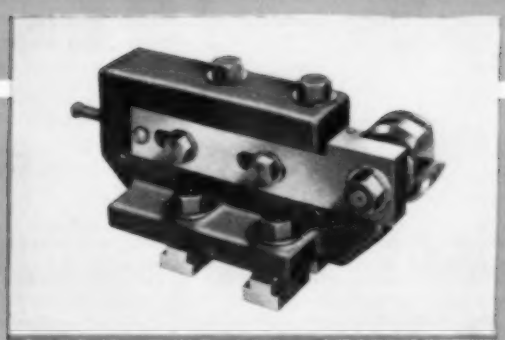
WIDE TOOLING VERSATILITY — through independently operated cross slides, spindle stopping (option) and a variety of standard and special attachments.

LONG OPERATING DEPENDABILITY — extra reserve power—strength for top performance with ***all*** tools.

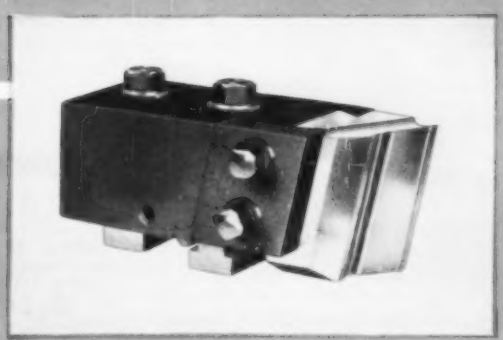
. . . the new 7/16" Six as on all Acme-Gridley machines—supplied as standard equipment—at standard tooling prices

Production efficiency is measured by the total cost of the job run. The "quick-change" tooling of Acme-Gridleys, in addition to their other outstanding high output characteristics, assure low costs on all production runs. Illustrated here are three of the many "quick-change" toolholders available for all size Acme-Gridleys, which require only the simplest of gauging on the machine when setting up or resharpening.

Hinged type toolholder allows quick-change side removal of drill bushings, counterbores and shank type toolholders by simply loosening two clamp bolts.



This "quick-change" toolholder permits the circular tool and block to be removed for tool sharpening.



Only two bolts need be loosened to release the tool for sharpening in this Dovetail Toolholder. A simple straight edge can be used to accurately align the tool when it is replaced.

Find out more about "quick change" tooling as engineered into Acme-Gridleys for lower total production costs.

National Acme

THE NATIONAL ACME COMPANY, 171 E. 131ST STREET, CLEVELAND 8, OHIO • Sales Offices: Newark 2, N.J., Chicago 6, Ill., Detroit 27, Mich.

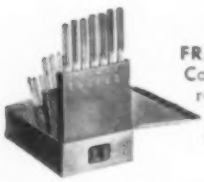
L·I
has a
REAMER SET
for every purpose, plant or pocketbook

HELICAL DIE MAKERS
5/32" taper per foot, and .006 per inch. High speed steel reamers with a high helix angle for machine reaming.

TAPER PIN
¼" taper per foot. Designed for machine or hand reaming standard taper pin holes.

DOWEL PIN
For machine reaming standard dowel pin holes. Sets from ⅛" thru ½".

WIRE GAGE
Wide range of 60 reamers for wire gage sizes from (.2280) #1 thru (.0400) #60.



FRACTIONAL SIZE
Complete range for reaming fractional size holes. Sets from 1/16" thru ½" by 64ths.

Other sets include: Letter size, Over & Under Size and Drill & Reamer Blanks. 34 sets in straight or spiral flutes to choose from, plus 8 combinations of drill and reamer blank sets.

L&I

"the reamer specialists"

LAVALLEE & IDE, INC.

CHICOPEE, MASS.

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Electrolytic grinding

Dear Sirs:
With reference to your "Two Reports on Electrolytic Grinding" (*AM*—Jan 13 '58, p106), can you give us any information regarding suppliers of the electrically conductive coolant and the power supplies mentioned?

Otto Kelm
Benton Harbor, Mich

Dear Sirs:
Would you please send us an extra copy of the report: "How to Machine Difficult Workpieces" (*AM*—Jan 13 '58, p106)?

We would also appreciate the names of the companies that make the necessary equipment for this work, and any other information you may have on the process.

George J Baker
Los Angeles, Calif

Anocut Engineering Co, 631 West Washington Boulevard, Chicago 6, Ill, sells the power supplies, and can provide bulletins describing the equipment needed and the proper procedures—Ed.

Left-handed lathe?

Dear Sirs:
Take a bow on your Field Report: "Puerto Rico: what's down there for US Metalworking" (*AM*—Jan 27 '58, p284).

I found it very interesting and informative, but there is one thing I am *almost* in doubt about concerning the lower-left picture on page 285. Does it indicate a new trend in left-handed lathe construction and operation, or is this an error in typesetting?

Honestly, it scares the H—— right out of me.

Charles Church
Hastings, Mich

Dear Sirs:
We are interested in purchasing a lathe like the one shown on page 285. . .

We have a man who is left-handed and feels he could do

SHOPMATES

N. Jarvis

WHAT BE YE A-HOLLERIN' FER SONNY?? I AIN'T DEEF!!
YOU AIN'T!! WHY I THOUGHT YOU— I MEAN— THEY TOLD ME — THAT IS — YOU USUALLY ER — WELL — YOU DON'T — ER — MOST OF THE TIME, THAT IS—
NOW THERE IS A SYSTEM — DIVIDE AND CONQUER — ONE DAY HE IS, NEXT DAY HE ISN'T!!
YESTERDAY HE COULDN'T HAVE HEARD THE MARINE BAND IF IT WAS MARCHIN' ACROSS HIS CHEST!!

Missing Something ?

The Answer is Pink !

Switch to PINK CIMCOOL

If you'd really like to be on the ball and improve your score in the cost department, then you too, should switch to CIMCOOL® S2 Concentrate. You can't miss, for CIMCOOL is actually the largest selling chemical cutting fluid in the world. And, with good reason.

CIMCOOL LOWERS COSTS because it's longer lasting in machines. Therefore, it reduces downtime and cuts labor costs for cleaning and changing.

CIMCOOL PERMITS FASTER SPEEDS and feeds, because of its chemical lubricity. It combines friction reduction and cooling capacity in a degree never before attained by old fashioned lubricants.

CIMCOOL IS CLEANER TO USE because it doesn't soil hands or clothing. It contains no skin irritants. And it's safer because it leaves no slippery film on shoes, floor, machine or work. It can't smoke, can't burn, and virtually eliminates rancidity and foul odors.

Three good reasons why you should *switch to* CIMCOOL. We know CIMCOOL Concentrate will keep you out of the rough every day in your plant. So call your CIMCOOL Distributor today. He'll be glad to give you *full* information on all the advantages of CIMCOOL Concentrate —as well as details on the entire family of CIMCOOL Cutting Fluids.

Or contact us direct and we'll have one of our Cincinnati Milling trained machinists call on you—without cost or obligation, of course. Write, wire, or telephone, Sales Manager, Cincinnati Milling Products Division, Cincinnati 9, Ohio.

CIMCOOL CUTTING FLUIDS

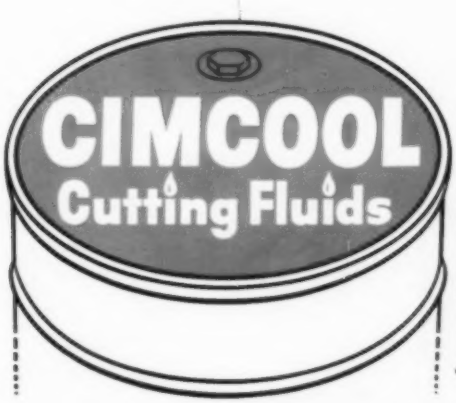
CIMCOOL **S2 Concentrate**—The famous pink fluid which still covers 85% of all metal cutting jobs. Effective, economical and clean.

CIMPLUS—The transparent grinding fluid with exceptional rust control. Also used for machining cast iron and as a water conditioner with CIMCOOL Concentrate.

CIMCUT **Concentrates (AA, NC, S5)**—For jobs requiring oil-base cutting fluids. Added to mineral oils, they give economical mixes for higher speeds and feeds.

CIMCOOL **Tapping Compound**—Permits the use of highest tapping speeds and increases tap life amazingly.

Also, CIMCOOL Bactericide and CIMCOOL Machine Cleaner.

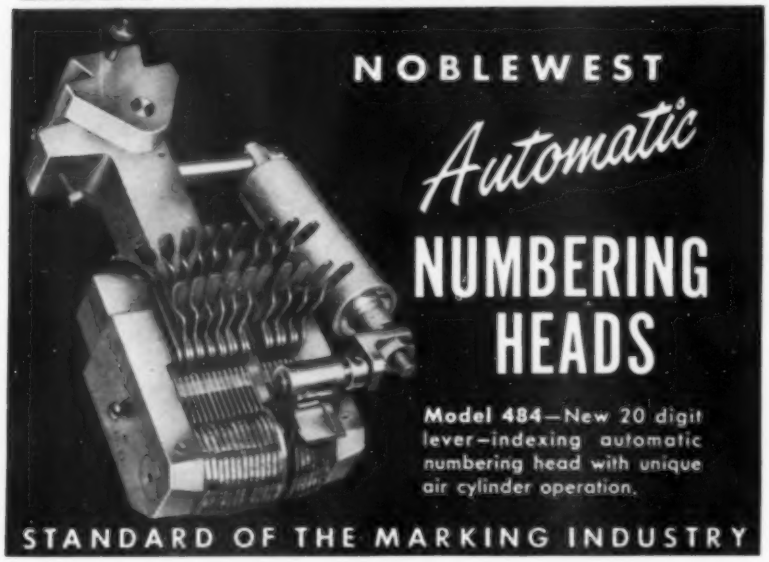


for 100% of all metal cutting jobs. The Answer is Pink!

Production-proved products of The Cincinnati Milling Machine Co.

® Trade Mark Reg. U.S. Pat. Off.

LEADERS IN INDUSTRY MARK WITH NOBLEWEST

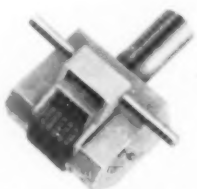


Noblewest Numbering Heads are unsurpassed in precision, speed of operation and long life for every kind of *permanently* indented numbering. They are the product of master craftsmen using only the finest selected steels. Made for use in either marking presses or Noblewest Roll Marking Machines, they are available in a wide range of automatic, non-automatic and lever operated models, a few of which are illustrated here. Applications are unlimited for constant, selective or consecutive (serial) numbering. Special numbering heads are designed and made for any requirement, including embossing heads.

Send for Numbering Head Catalog containing complete technical information. Noble & Westbrook Manufacturing Co., 17 Westbrook St., East Hartford 8, Conn.

Model 129—Combination numbering head. One section has automatic operation for serial numbering—second section is non-automatic for selective numbering.

Model 131 — Automatic numbering head with extended frame to accommodate marking die or interchangeable steel type.



Model 10 — Standard Automatic Numbering Head. Carried in stock in 6 and 7 wheels. Number sizes: 1/16 - 3/32 - 1/8 - 5/32 - 3/16.

Visit the Noblewest MARK-O-RAMA—Booth 837—at the Tool Engineers' Show

MARK IT BEST WITH NOBLEWEST IMPROVED MARKING DEVICES

NOBLEWEST

ORIGINATORS OF THE ROLL MARKING PROCESS

MARKING
NUMBERING
EMBOSSING
GRADUATING

better work on a left-handed lathe.

H Bibicoff
Wayne, Mich

Dear Sirs:
I notice on page 285 (*AM*—Jan 27 '58) that someone has developed a lathe for left-handers. Do you suppose there's much of a market for these?

Lou Wiegand
Sidney, Ohio

Obviously, the picture was reversed from left to right somewhere along the way. To the best of our knowledge, there is no trend toward left-handed lathes in Puerto Rico or elsewhere—Ed.

Plastic injection molds

Dear Sirs:
I have just borrowed a copy of a reprint from *American Machinist* dealing with "Advanced Tool Designing for Plastic Injection Molds" (*AM*—May 7 '56, Special Report Number 421).

This article is only available to us on a 10-day-loan basis, but it has so impressed our engineering staff that I would be interested in knowing if extra copies could be obtained after this rather long time lapse.

R. Hardaker
Cobourg, Ontario

Copies of this Special Report are still available at $.25 each. Our Reader Service Department will be glad to furnish a list of the titles and prices of other Special Reports currently in stock—Ed.

Helpful Henry

by L. Hoppes

"Had to sweep under it, so I just started 'er up while you were gone."

CALENDAR

AMERICAN MACHINE TOOL DISTRIBUTORS ASSOCIATION — Spring Meeting, Mar 10-11, Hotel Roosevelt, New Orleans, La.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS AND AMERICAN ROCKET SOCIETY — Joint Aviation Conference, Mar 17-20, Hotel Statler-Hilton, Dallas, Texas.

AMERICAN SOCIETY FOR METALS (Golden Gate Chapter)—Annual Western Welding, Brazing, and Heat-Treating Conference, Mar 27-28, Stanford Research Institute, Menlo Park, Calif.

SOCIETY OF AUTOMOTIVE ENGINEERS —Production Meeting and Forum, Mar 31-Apr 2, The Drake, Chicago, Ill.

SOCIETY OF AUTOMOTIVE ENGINEERS —Aeronautic Meeting and Display, Apr 8-11, Hotel Commodore, New York, NY.

AMERICAN WELDING SOCIETY—Annual Meeting and Welding Show, Apr 14-18, Kiel Auditorium and Statler Hotel, St Louis, Mo.

AIEE, ASME, IRE—Joint Conference on Automatic Techniques, Apr 14-16, Hotel Statler, Detroit, Mich.

AMERICAN SOCIETY OF TOOL ENGINEERS—Tool Show and Annual Meeting, May 1-8 (closed Sunday), Convention Center, Philadelphia, Penna.

NATIONAL TOOL & DIE MANUFACTURERS ASSOCIATION—Spring Meeting, May 3-6, Statler Hotel, Washington, DC.

AMERICAN SOCIETY FOR METALS —Southwestern Metal Exposition and Congress, May 12-16, State Fair Park, Dallas, Texas.

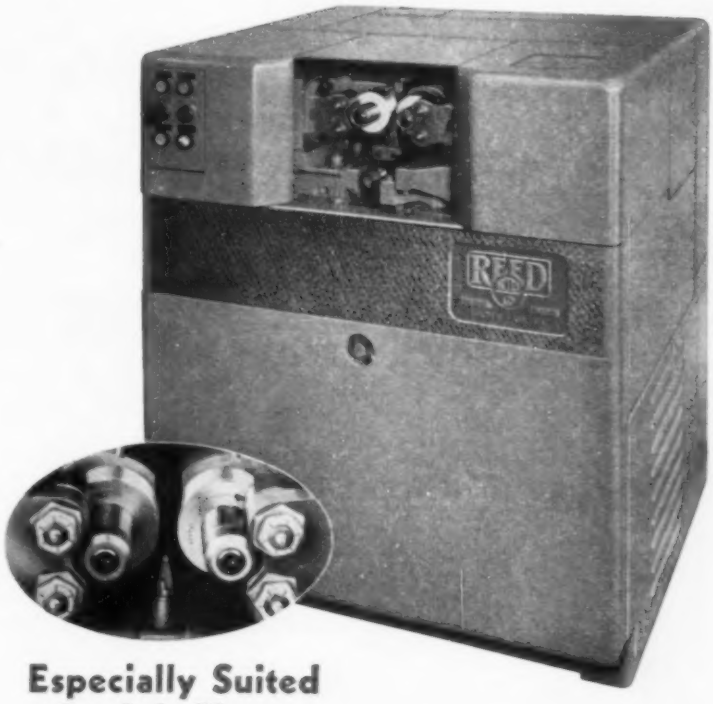
AMERICAN SUPPLY & MACHINERY MANUFACTURERS ASSOCIATION — Triple Industrial Supply Convention and Exhibition, May 26-28, Madison Square Garden, New York, NY.

NATIONAL MATERIALS HANDLING EXPOSITION and concurrent ASME conference on Materials Handling, June 9-12, Public Auditorium, Cleveland, Ohio.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-Annual Meeting, June 15-19, Hotel Statler, Detroit, Mich.

NEW! Two Cylindrical Die Type THREAD ROLLING MACHINE

HORIZONTAL TYPE



Especially Suited for Job Shops

for Both In-feed and Thru-feed Rolling

The use of highly skilled setup and operating personnel is not required, because of the simplicity of operation and of changeover from one job to another. A cam-actuated head feeds the dies into the work and a fine micrometer adjustment provides for accurate final sizing. Can be used for manual, semi-automatic or completely automatic feeding.

Supplements widely used Reed cylindrical die thread rolling machines of the three die type.

DIAMETER CAPACITIES

In-feed - up to 2 inches

Thru-feed - up to ¾ inch

Write for Machine Bulletin B 111-1

REED ROLLED THREAD DIE CO.

Specialists in Thread and Form Rolling Tools and Equipment

WORCESTER 1, MASSACHUSETTS, U.S.A.

Sales Offices In: Buffalo, Chicago, Cleveland, Compton, Calif., Denver, Detroit, Englewood, N. J., Houston, Indianapolis, Milwaukee, Montreal, New York City, Phila., Pittsburgh, St. Louis, Syracuse, Toronto

TRM-188

If you buy a welding machine without all these features.....

You're

Does it have jet-stream ventilation?

The ultimate advantage of this feature is that the machine will run cooler, need less maintenance, last longer. High-velocity air has a scouring effect, keeps dirt from collecting on coils and stacks. Remember, dirt not only impairs efficiency but also retains heat.

asking for trouble!

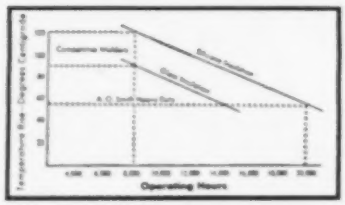
Only machines offering *all* these advantages can truly provide lasting, highly satisfactory, trouble-free service. Only A. O. Smith machines can answer the challenge!

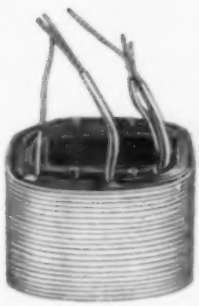
Only A. O. Smith offers you the welding machines of tomorrow — today. Every machine in the line offers the features illustrated. And these and other A. O. Smith features add up to longer life, fewer production stoppages due to breakdowns, less cost for maintenance and service.

Further, A. O. Smith offers a complete line — in most cases several choices in each size. That means you can choose a machine tailored exactly to your present and future needs.

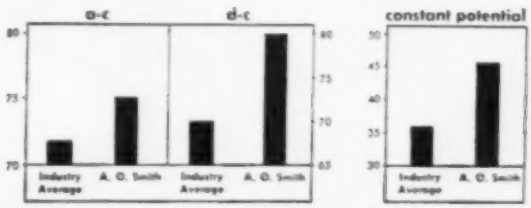
Look these features over carefully. Then see if the next welding machine salesman that calls can match them. He can't! Only the man from A. O. Smith can! Check him before you buy!

Does it have silicone insulation? All A. O. Smith machines do. Silicone (Class H insulation) is the newest, most expensive insulation known to the electrical industry. Despite higher costs, A. O. Smith is the *only* machine manufacturer using silicone "right-across-the-board" on *all* models. Silicone permits higher operating temperatures under peak load conditions and absolutely prevents coil damage due to moisture accumulation. Longer life is assured.





Does it offer doubly protected coils? On A. O. Smith units, coils are not only vacuum-impregnated, they're also precision wound. Result: They're resistant to moisture and there's no possibility of chafing each time an arc is struck. This double protection results in stepped-up efficiency—for years on end.



Does it have bonus open-circuit volts? The charts above provide an idea of why all A. O. Smith machines "go beyond the call of duty"... provide bonus open-circuit volts for more force, more drive and greater arc stability. It's this bonus margin that makes A. O. Smith welders and rectifiers the machines of the future.

Does it offer a totally enclosed pre-lubricated, ball bearing, 1/6-hp fan motor and big fan? Only A. O. Smith welding machines are built with a big husky, forget-about-it motor that needs no reservoir filling or other costly production-stopping maintenance. Biggest fan in the industry, sustains tremendous volume of high-velocity air to keep machine running cool.

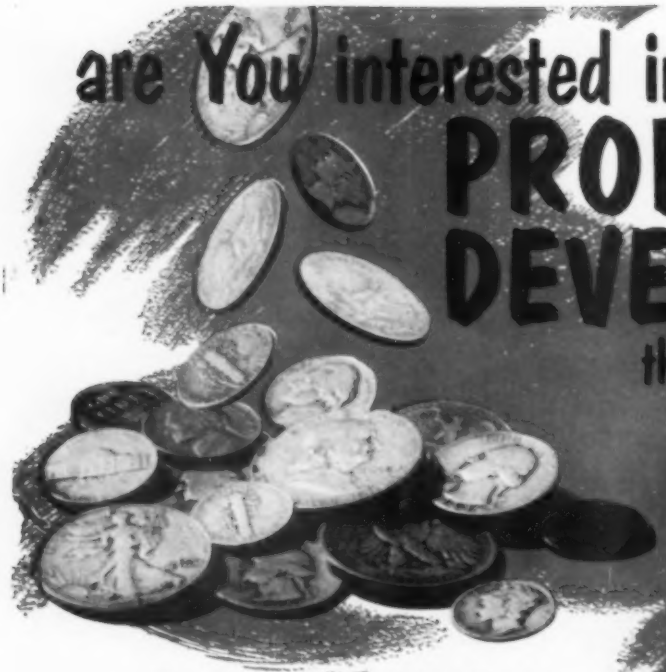
If you'd like to know more about the extra things A. O. Smith does to help your welding machine investment pay bigger returns . . . details about the complete A. O. Smith line of a-c, d-c and constant potential machines . . . contact your "man from A. O. Smith" or write direct.

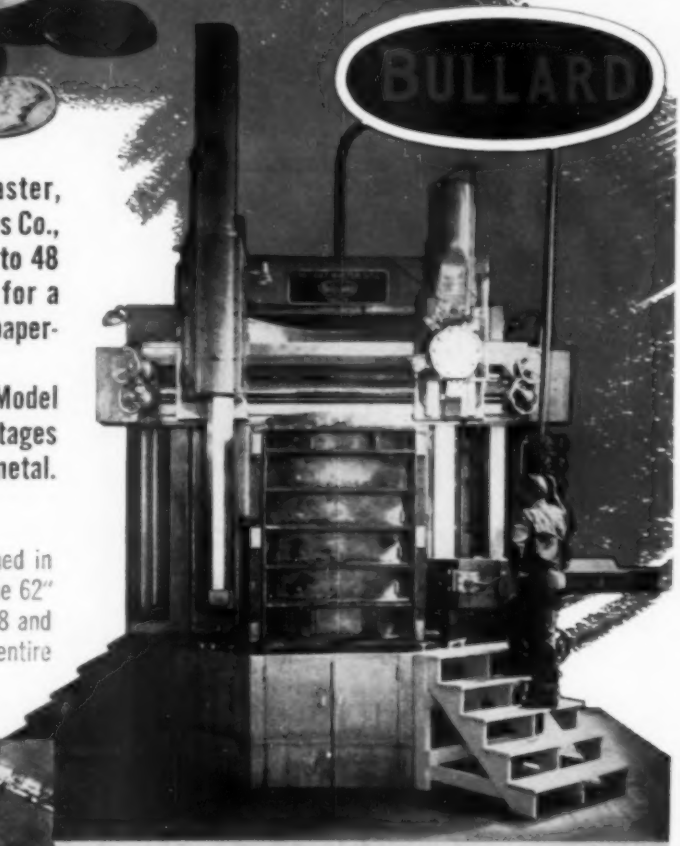
Through research . . . a better way

A.O.Smith
CORPORATION
WELDING PRODUCTS DIVISION
Milwaukee 1, Wisconsin
A. O. Smith International S. A., Milwaukee 1, Wisconsin, U. S. A.

are You interested in PROFIT DEVELOPMENT

through reduced machining time and Lower Costs . . .





The new 66" Bullard Cut Master, Model 75 purchased by E.D. Jones & Sons Co., Pittsfield, Mass., has reduced from 65 to 48 hours the machining time required for a 4,000 lb. stainless steel piece used in a paper-making machine.

The Bullard Cut Master V.T.L., Model 75 line offers many features and advantages to help you — cut costs when cutting metal.

The part, 68" high, formerly had to be machined in three operations. Now, with an extension on the 62" Ram, a table speed of 9.6 r.p.m., feed of .0208 and ⅛" depth of cut, it is possible to machine the entire depth in one operation.

Close-up showing step boring and facing operation with 370 grade carboloy tool.

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SPOT NEWS...

- **About 2% of all machine tools and metalforming equipment** in use today is leased, according to U S Leasing Corp president William R Heins, who estimates dollar value of leased equipment runs about $180 million.
- **Research contract on art of broaching** is about to be awarded by Air Materiel Command at Wright-Patterson Field. Some Washington officials hope that the low bidder is a broaching machine maker, rather than an aircraft company, many of which have been keen about such contracts in the past.
- **Air Force may develop a manned glide rocket** and a ramjet-powered manned bomber. The rocket would be a two or three-stage machine, the bomber one capable of 2750 to 4000 mph speeds. Boeing, meanwhile, is studying development of manned space aircraft as part of its R & D program.
- **New vacuum-melted steel alloy, J-1300, can be used at 1350 F,** is claimed to have the highest strength-to-weight ratio of any iron-based alloy in that range. Developed by GE's Metallurgical Products Dept, the alloy (Carbon—0.08% by weight, Al 0.25, Ti 2, Zr 0.25, Ni 33, Cr 14, Mo 4, W 6.5, and iron the balance) has rupture strength at 1300 F comparable to that of competitive alloys at 1200 F, tensile strength at 1200 F of at least 135,000 psi. Alloy forges easily at 1700 to 2100 F.
- **Russia produced 204,000 tractors but only 495 automobiles last year,** according to an official Soviet report.
- **Fibrous glass laminates** with a tensile strength higher than that of heat-treated steel at room temperature are being developed for the Navy.
- **Welding lead that can handle currents up to 650 amps,** and which can be used with conventional aluminum welding equipment, has been developed by the British Welding Research Assn. With it, 1-in. aluminum plate can be welded in only two passes at a weld rate of 12 ipm.
- **Engineering students are now "aggressively pursuing recruiters,"** a complete about face in less than a year, it was reported at a meeting of the Western College Placement Assn. Nevertheless, one school reports the average engineer recruit will still get $468 or so a month to start.
- **Russia's first automated single-rim spin gear production line** is turning out gears of 10 dimensions with only three operators on the entire line. Output is said to be 4 to 5 times as fast as with previous methods.
- **Automation is causing less tool and die work and more job machining,** industry leaders recently told the Defense Dept. Reason: machine tool builders now are building not only machines but, more and more, complete lines of tooling. This means tool and die people must rely increasingly upon existing machine tools to generate jig and fixture business. As a result, the tool and die industry is trying to fit its machine facilities into missile subcontracting.
- **Depth of scratches in machined metal** can be measured in much the same manner as astronomers measure the depth of moon craters. Boeing optics expert Bobly Seibel has developed an instrument that measures the length of shadow to give scratch depth. Process can measure minute scratches, something the probe measuring system could not do.

Spot index to major News stories...

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57-74

Specify Ex-Cell-O standard power units and cut your machine tool lead time

Today's demand for increased productivity, lower per-unit cost, even on relatively short runs, is being met economically by automatic, single-purpose, high-production machines—consisting essentially of a plain base and one or more Ex-Cell-O Quill-Type Hydraulic Power Units. Their flexibility allows them to be used over and over again, spreading their initial cost over many productive years.

These standard, self-contained Ex-Cell-O Hydraulic Power Units are now being used for: drilling, counterboring, spot facing, reaming, as well as prime movers for milling equipment. With multiple spindle head attached to quill flange, multiple operations may also be performed.

For the full story on the cost-saving advantages Ex-Cell-O Self-Contained Power Units offer your short- or-medium-run production requirements—get in touch with your local Ex-Cell-O Representative. Or, if you prefer, write direct to Ex-Cell-O, Detroit.

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WASHINGTON...

East-West trade curbs...

Free world nations may soon agree to ease export controls on metalworking machinery shipments to Soviet Russia and the Eastern bloc.

An international trade policy group, named the Coordinating Committee, is talking about a review of the broad general list of items which member nations have agreed to withhold because of warmaking potential and strategic importance. The Committee, made up of free world representatives, meets regularly in Paris to decide what should not be sent to Russia and its European satellites.

There has been no review of either the embargo list or over-all policy since 1954, when the present list, including metalworking machinery, was approved. Since then, the U S has agreed to a general loosening of controls over shipments of strategic items to Red China.

Pressure for a review of overall policy is mounting. U S allies—particularly Britain and Germany—are looking to eastern markets. Western trade representatives make the point that bloc industrial capacity has grown to the point that Communist nations are now exporting items which the free world restricts in its shipments.

Soviet overtures...

Added to allied pressure, the new Soviet ambassador to the U S, Mikhail Menshikov, has asked Secretary of State Dulles to consider expanding "mutually profitable" trade between the two countries. Dulles says the U S will stick to its stand of opposing shipments of strategic items of warmaking potential, but is willing to review the definition of such items.

A Cocom review could hurt as well as help U S machinery exporters. If Washington agrees to a broad free world relaxation of controls, it will mean new markets for U S goods. But if the U S agrees to let its allies step up shipments while holding to its own restrictions for U S companies, it would give their competitors a distinct advantage.

Military contracting going up...

The volume of contract awards for military hardware is starting to reflect the post-Sputnik switch in defense policy—lifting the ceiling on expenditures and stepping up missile and other key programs.

From a low of $300 million in new contract awards during July 1957—at the height of the defense budget squeeze—new military hardware orders went to $1.3 billion in December 1957, is now rising to a peak to be attained in the April-June quarter, then will level off.

These are latest Pentagon quarterly figures on new major procurement contracts: July-September 1957, $2.2 billion; October-December 1957, $3.9 billion; January-March 1958, $4.9 billion; and April-June 1958, $5.1 billion.

For the next fiscal year, new orders are expected to total $8 billion during July-December 1958, and $7.4 billion during January-June 1959.

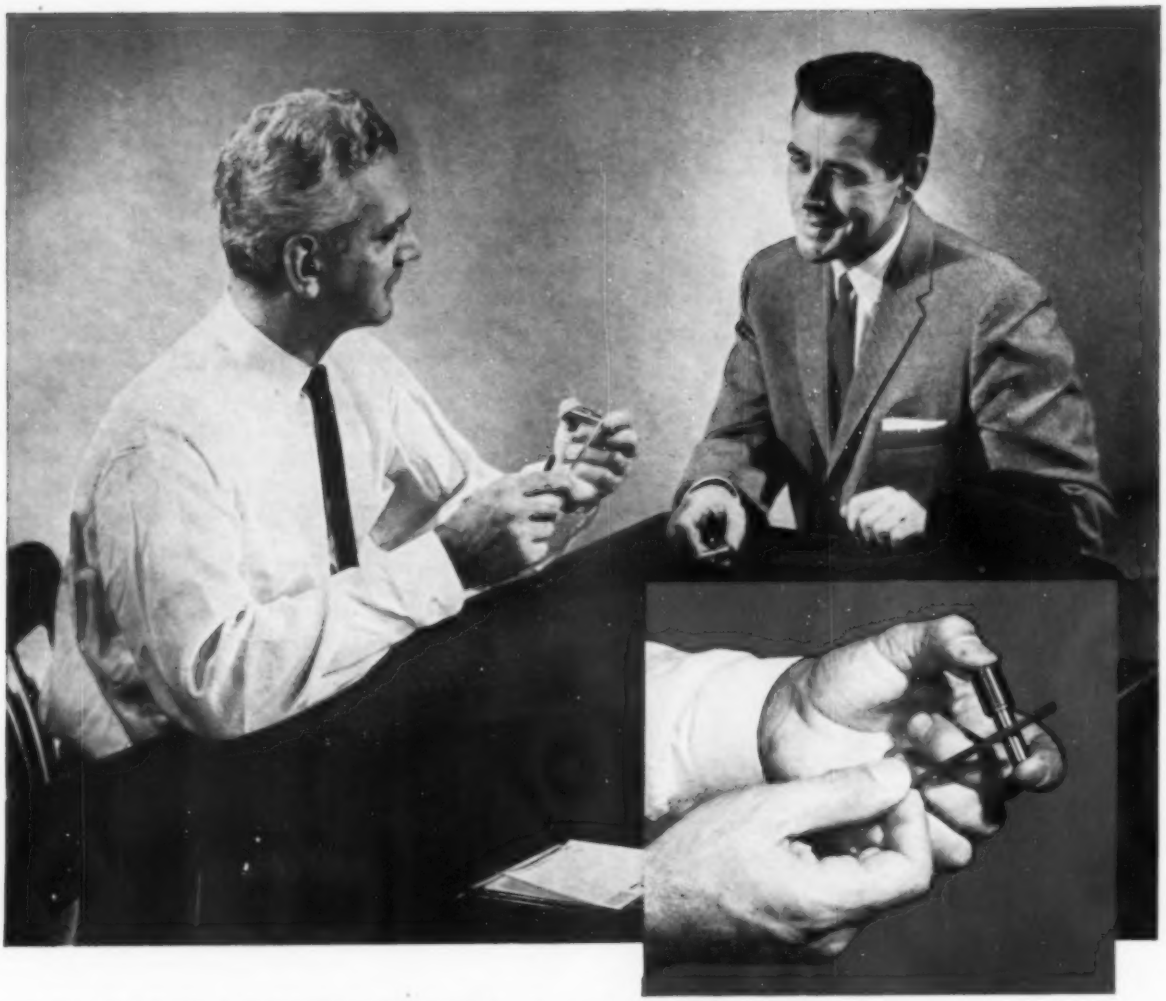
The 1958-59 figures, of course, would rise if Congress were to vote more money for defense than the administration has asked for. Considering the present Washington atmosphere, this is a very strong possibility. Pentagon budget experts even hint strongly that a supplemental fiscal 1959 appropriation request is being considered.

Defense spending figures prominently in the administration's blueprint for bolstering the national economy, so there's no fear that the White House would deliberately hold back spending defense funds voted by Congress—as it has done in the past. Indeed, a recent Presidential report on the state of the economy cites— almost boastfully—that "the placement of defense procurement contracts is being sharply accelerated. These contracts will provide increased employment in many industrial communities."

New missile projects...

There's more evidence of the metalworking industries' dominant position in the burgeoning missile program. Latest Pentagon disclosures of new missile projects show: Temco Aircraft Corp is prime contractor on the Navy's Corvus air-to-surface missile; Rheem Mfg Co produces the warhead for the Navy's Sparrow III, and Elgin National Watch Co the safety and arming; American Machine & Foundry is developing an auxiliary power unit for the Air Force's Atlas ICBM; Fairchild Engine & Airplane Corp is prime contractor of the Air Force's Bull Goose surface-launched diversionary (or electronic countermeasure) missile, with AM&F on ground support equipment and Paul Omohundro Co of Los Angeles on the airframe components; McDonnell Aircraft is prime on the Air Force's Green Quail air-launched diversionary missile, with AM&F producing support equipment.

Also in the works are North American's Hound Dog air-to-surface missile for the Air Force, to be carried by Boeing's B-52, and an unnamed Air Force project to develop an airborne IRBM.



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It's no longer a question of "IF". The new Sheffield Flint-Hard Nitrigage* has IT. And at STANDARD STEEL PRICES.

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ACT NOW and start Cutting Costs! Order a sample now. Put it to the file test and then on the job. The longer wear life reduces your outlay of funds. Write to the Sheffield Corporation, Dayton 1, Ohio, U.S.A., Dept. 1.

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DETROIT...

Production pruned again...

First quarter assembly schedules are being steadily cut back to "balance output to inventory," Detroit's favorite way of saying that cars aren't selling. Current forecasts call for about 1.4-million units, 300,000 under initial goals.

Hardest hit of the Big Three is Chrysler Corp. January 1-February 8 production, compared with last year for each division, was: Plymouth, 45,059 vs 82,177; Dodge 10,977 vs 35,920; DeSoto 5003 vs 20,885, Chrysler 7239 vs 18,306; and Imperial 2125 vs 4714.

Of these, only Dodge can lay a real claim to being strikebound, but UAW-CIO says that the sporadic day-long walkouts over production standards please management, which purportedly looks upon them as a blameless, relatively cost-free way of cutting output.

As a countermeasure, the union has taken the unprecedented step of offering those Dodge employees fired for disciplinary reasons pay equal to that which they would have earned if still at work. This, of course, assumes early arbitration of each case.

In the same period, Ford Motor Co totals have dropped from 247,318 to 168,070. Edsel produced a mere 2043 cars, lower than any brand except Packard.

General Motors is holding up a little better, with a loss of only 55,000 units out of last year's total of 390,412.

Buick is the weakest link in the GM chain and Oldsmobile is the surprising maverick. That make is strongly entrenched in third sales place and stands a good chance of holding it.

American Motors' Rambler continues to enjoy increasing public acceptance. First quarter production targets are an amazing 135% greater than last year's fair performance. The company confidently expects to close its books in September with its first fiscal year profit ($6-$10 million) since the merger with Hudson.

St George and the Dragons...

A-M's George Romney shocked fellow auto company presidents with his recent suggestion that General Motors and Ford be split and become the source of new companies. He drew a parallel with Standard Oil, wherein everyone concerned "benefited greatly from the creation of 34 companies out of what was previously a single enterprise."

Because he is also president of the Automobile Manufacturers Association, anything Romney says has the weight of a medicine ball. He is noted for spontaneity in public utterances but this bit was carefully prepared, printed, and distributed at the time of the Kefauver hearings. Those close to Romney say that he sat behind his own typewriter.

His intention is obscure unless it is to set people of influence to thinking—A-M has found its niche by filling the small U S car vacuum. But splitting a couple of divisions away from GM and one from Ford would weaken both parent and child.

Trucks of the future...

Two experts expect radical changes in trucks of the foreseeable future. Theodore Ornas of International Harvester says that cab shapes and locations will be revamped with emphasis on lightness and driver comfort. New, lower, more compact designs will require changes in chassis and engines, as well as package items such as air conditioners.

GMC's Donald J LaBelle expects air suspension to revolutionize truck design. With high frequency road vibration and shock reduced to a minimum, light-weight materials such as aluminum, magnesium, and reinforced plastics can be substituted for steel. Less costly manufacturing methods, such as welding, can be used to a greater degree. LaBelle anticipates that overall weight could be reduced by nearly 2000 lb. for the average heavyduty tractor. Obviously, most every mechanical part would be redesigned accordingly.

Small car defined...

From talks with those close to small cars now on the drawing boards of the Big Three, it is apparent that they will be built on a wheelbase of approximately 100 in. and have about 1 hp for every 30 lb. of curb weight.

Tooling costs will be kept down by offering only sedan and station wagon bodies, probably of the 2-door variety. Biggest single saving will result from using less materials. Much attention will be paid to basic simplicity, with attendant savings in not having to provide for optional accessories. For example, doors can be lighter and cheaper when they don't have to be redesigned around an optional electric window regulator.

With costs ever in sight, potential small car builders are still debating whether they should spend their money on a beefy but simple 4-cylinder engine hooked to a torque-converter, or on a fancier six and a manual transmission.

At press time, Ford was closest to actual small car output, GM second, Chrysler a poor third.

a sensitive, short or long run tool especially developed for machining small parts to close tolerances

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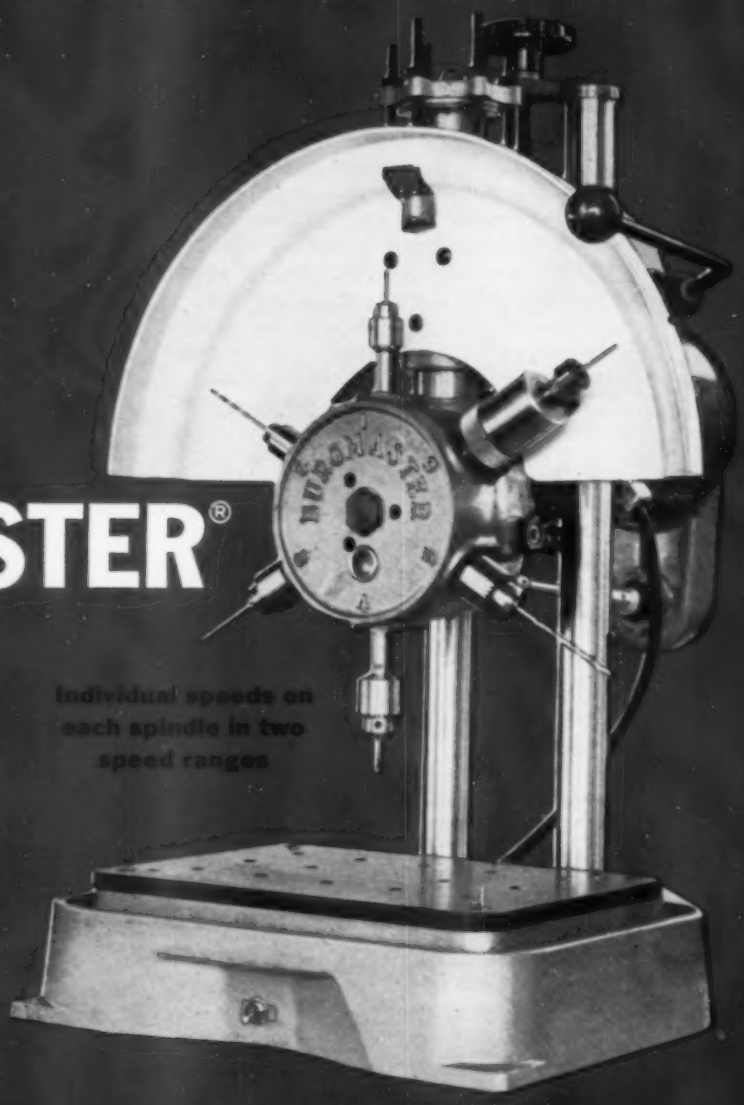
Bench Model



Individual speeds on each spindle in two speed ranges

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Increasing motor and controls
less tooling shown

12-speed, 6-spindle, power-indexing Bench Model Turret Drill

Drilling, tapping, reaming, counterboring, countersinking, spot facing and numerous other second operations can be accomplished — with one operator — in one location — quickly and simply. The Burgmaster principle is basic. Each tool change is brought *to* the work. The need to carry or shove, then realign the work manually is eliminated. Time loss is cut, accuracy is increased, fixture costs are reduced.

SPECIFICATIONS: capacity, 3/16" in steel, 1/4" in aluminum; overall dimensions, height, 31½", width, 17", depth, 20"; motor, ¼ hp; chuck to base clearance, 12"; maximum spindle travel, 2⅜"; center of spindle to column clearance, 5⅛"; geared head permits each spindle to operate at its own predetermined speed from 350 to 6200 rpm.

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AIRCRAFT and MISSILES...

TRENDS

What's in a missile?

Anybody who's been laboring under the delusion that a missile is sort of a nice simple rocket, not nearly as complex as a plane, had better think again. Today's ballistic missiles, like the Redstone and Jupiter, each have from 6000 to 10,000 separate assemblies made up of anywhere between 20,000 and 30,000 component parts.

Authority for this is Redstone Arsenal's Deputy Director R W Cuthill, who told a recent meeting of the American Ordnance Association that the ballistic shell alone has somewhere between 6000 and 8000 parts.

The engine has 1200 to 1500 parts, and the guidance and control system has another 15,000 to 20,000.

Add to that 1200 to 1500 electrical, pneumatic and hydraulic components that, in Mr Cuthill's words "tie the missile together" and you get a lot of metalworking in one product.

In fact, it's been estimated that a large missile program has contractors and subcontractors in every one of the 48 states, with contracts ranging from $100,000 to several million dollars per state.

Space Age confab . . .

As we mentioned several weeks back, the Los Angeles Chamber of Commerce is going to hold a big, top-level missile conference next month.

Called, with typical LA Chamber of Commerce reticence, the "1958 Western Space Age Conference & Exhibit," the meeting is intended to bring more missile work into the area.

Local firms interested in missile subcontracting will have a chance to get together with defense officials and missile primes.

The Chamber feels that there are substantial differences between the aircraft work Los Angeles area firms are familiar with, and the missile work that will replace it increasingly.

Its the Chamber's idea, too, that if local subs know a lot more about missile contracting procedures, fabrication methods and lead times, they'll have a substantial advantage in competing for more missile business.

Where's the speedup?

"We've heard a lot of talk about the post-Sputnik speedup in aircraft and missile output," a Los Angeles area aircraft manufacturer says, "but we haven't seen much action."

All the recent encouraging talk—about awarding the WS-110 chemical bomber to North American, the Thor going into production, and so forth—isn't having much effect on California's defense economy.

Employment continues to drop, albeit more slowly than it did last fall. And small subcontracting firms are going deeper and deeper into the hole.

But maybe all this persistent gloom and doom is purely a relative thing. Los Angeles area's aircraft and missile industry payrolls today stand about where they were two years ago—**and at** that time the industry thought those figures were pretty hot. The current LA area payroll is pegged around $25 million a week, and that's not chickenfeed by any standards.

IAM-Convair battle it out . . .

As we go to press, International Association of Machinists is sitting down at the bargaining table with Convair—presenting simultaneous proposals to its San Diego (16,000 IAM workers alone), Fort Worth, and Pomona, Calif, plants.

Those same proposals, Convair spokesmen say, are so outrageous they could seriously affect the company's efforts to get more military and commercial contracts.

They include such changes in the IAM-Convair collective bargaining agreement as:

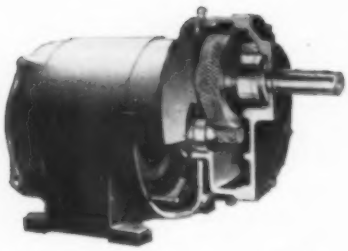
- A full union shop.
- Severance and relocation pay in the event of cutbacks or transfer of employees.
- An apprentice program jointly administered by Convair and the union, which would include highly technical occupations necessary to production of rockets, missiles and aircraft.
- Payment of bonuses and traveling allowances for employees assigned to hazardous or remote operations.
- Increased vacation, sick leave, paid holiday and pension benefits.
- Adjustment of a cost-of-living clause to existing wage rates.
- A general wage increase of 6% after cost of living adjustment for all IAM-represented workers.
- Revision of job descriptions, applications and wage structures.
- Changes in security regulations for workers.
- "Clarification of 'other language' to remove ambiguities and misunderstandings."

The current two-year contract granted 4 to 6% wage increases to 16,000 workers. And it provided upgrading of 2400 jobs, plus 26¢ worth of new fringe benefits per hour. Convair's basic factory wage today is $1.56 an hour, its maximum is $2.68 an hour.

EVEN MONEY IT'S A MASTER GEARMOTOR GOING TO WORK!

We *make* a lot of Gearmotors here at Master. The point is, we've been *selling* more than all other makes combined. There are more Master Gearmotors in *use* than all others. Users *buy* more. And you don't find any foolish motor buyers—or not for long.

So it's obvious that Master Gearmotors simply must meet most requirements best. If you're not a Master Gearmotor user, now's the time to find out what you're missing!



Master Gearmotors are available with all Master motor types in right angle and parallel construction.

IT'S TIME YOUR DRIVE REQUIREMENT MEETS ITS MASTER

With five types of parallel and right angle Gearmotors, Master has the flexibility and choice of design you need.

With electric motor and gears combined into a compact, integral power unit, you reduce costs and increase efficiency through elimination of belts, couplings, chains, sprockets, external bearings or separate reducers.

They are available in sizes from ⅛ to 125 H.P. You can integrate with the gearmotor: electric brakes, 3 types of variable speed units and fluid drive in any combination.

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MACHINE TOOLS...

General Motors to make small car . . .

General Motors is believed to be committed to making a small car in this country. President Harlow Curtice neatly dodged any pertinent comment about it at the recent Congressional hearing on auto prices. Nevertheless it is in the works, somewhere in the three-year cycle that it normally takes to develop and finally put a new car on the market.

Chevrolet is said to be in the blueprint stage of a six-cylinder engine for a small car, with the engine probably having 75 to 100 hp.

No one seems to know what the production rate will be, but it is a reasonable guess that at first the engine line will be tooled up for 75 to 100 engines an hour.

Just when the small car is scheduled for introduction is a matter of speculation, but the talk is that it will come out sometime in 1959.

Prints for bids on the cylinder block line and on other engine components probably will be put in the hands of machine tool builders this spring, with orders placed in the summer. It depends on how fast Chevrolet wants to move. Chevrolet has been known to get going far more speedily than anyone anticipated when it really wanted to.

General Motors has had years of experience in making small cars in England, in Germany and in Australia (with the Holden, which has been a big success from the beginning).

Current importation of Vauxhalls and Opels from England and Germany are looked upon as stopgaps until General Motors begins to turn out a small car here.

With General Motors ready to start a small-car manufacturing program, observers feel that Ford won't be far behind. It may even be ahead. And Chrysler will have to jump into this market too. The Chrysler management has gone on record in favor of making a small car abroad and importing it rather than producing it here.

With these stirrings in the small-car field, there is promise of some machine tool orders in the Detroit area. But the orders probably won't come until the final half of the year.

Transmission tooling looms . . .

New transmissions in the rear are expected to be another source of machine tool business in Detroit later in the year.

Buick and Detroit Transmission are likely within six weeks to put out preliminary prints to machine tool builders to tool up for the new transmission, presumably for 1960 cars. It is common practice for General Motors to introduce major new designs in the higher-price, lower-volume car lines. Then a year or two afterwards the innovations reach Pontiac and Chevrolet.

The new transmission will make necessary major changes in other parts, including the engine.

Intense sales rivalry will be at work in connection with the new transmissions.

Chrysler is thought to feel that it should not lead off in developing a new transmission because of the big investment required. But let General Motors get started and Chrysler will be taking action within a matter of days. Ford is reported yet to be convinced.

With these automotive tooling prospects looming, more than one machine tool builder believes that, once the orders out of Detroit start to flow, they will stay in good volume for at least a year or two. But bear in mind that none of these programs promises to break until after midyear at the earliest.

Machine tool net new orders turned up in January from the December low, preliminary estimates indicate. January bookings are believed to have been around $22 million, compared with $18 million in December.

Washington lists top builders . . .

Largest U S metal-cutting machine tool builders, based on shipments in first nine months of 1957 and ranked by size, are: Cincinnati Milling, Bullard, Giddings & Lewis, Kearney & Trecker, Warner & Swasey, Sundstrand, W F and John Barnes, R K LeBlond, National Acme, Gleason, Brown & Sharpe, Ex-Cell-O, Gisholt, Landis Tool, Pratt & Whitney, Foote-Burt, Monarch, Cross, Jones & Lamson and Norton.

Biggest forming and shaping machine tool builders are, in order of size: Danly, Clearing, Bliss, Verson, Baldwin-Lima-Hamilton, Cincinnati Shaper, Waterbury Farrell, Minster, Niagara, Dreis & Krump, Hydraulic Press, Farnham, Lake Erie Engineering, Cleveland Crane & Engineering, and Federal Machine & Welder.

These facts came out in a report of the U S Attorney General, dated February 10, giving the machine tool industry a clean bill of health so far as any monopolistic practices are concerned. For full story, turn to p138.

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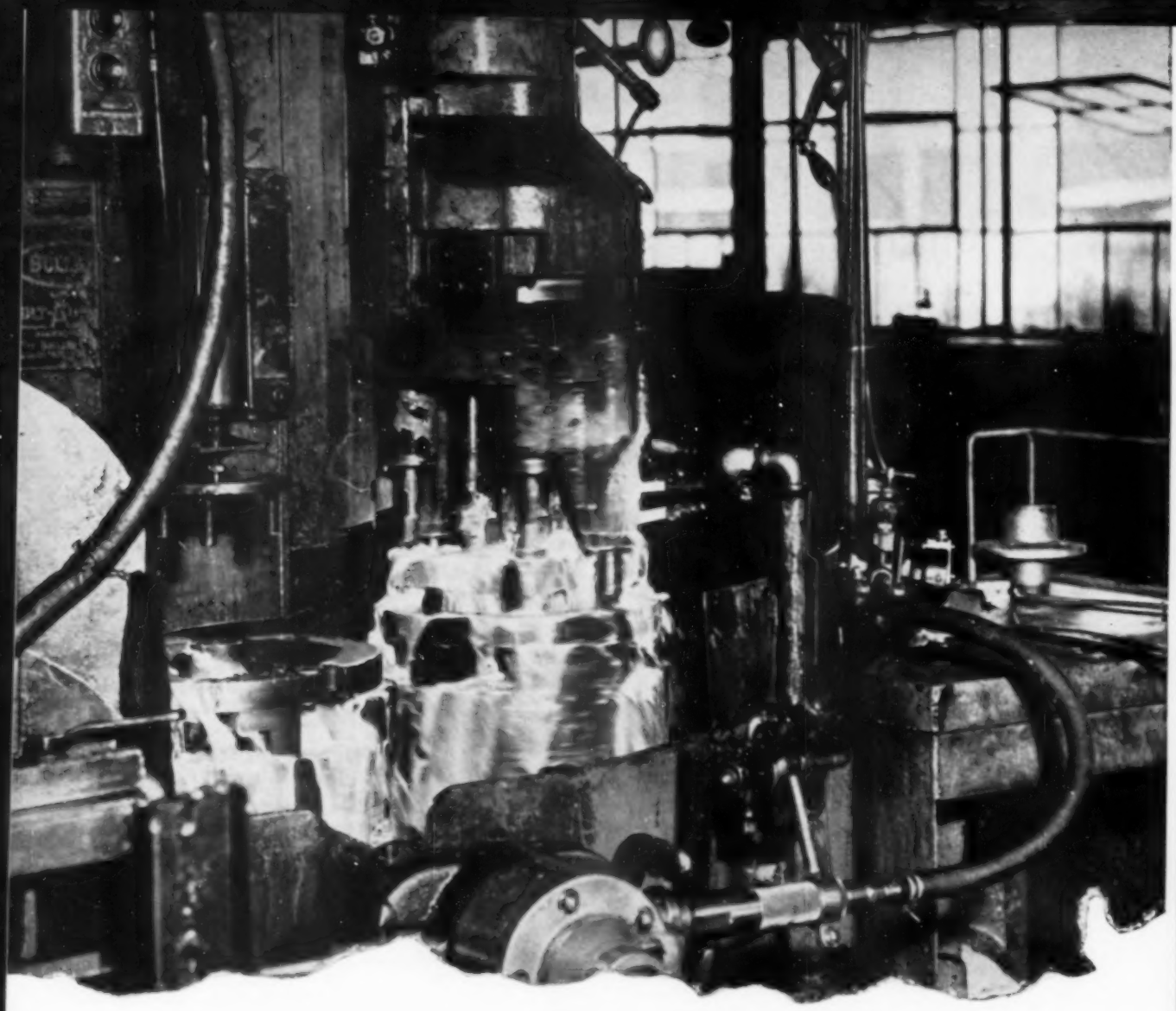

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WHAT'S AHEAD... in Metalworking

TRENDS

Still plenty of bounce left in Metalworking...

There is still a considerable amount of bounce in metalworking production, despite a slow but steady decline in the operating rate.

American Machinist Production Index estimates that the physical volume of output is down about 12% from the all-time peacetime peak attained in December 1956.

A further slideoff from the present level is anticipated in the next month. Indications are that it may not be more than another 5%.

Capital goods and consumer durable products, principally automobiles, account for most of the drop. Manufacturers' order books in the machinery field have dwindled continuously for months, with curtailment in production an inevitable consequence.

Immediate outlook for industrial machinery orders is poor, with many makers feeling that it will be the fourth quarter before much gain will be registered.

Small steel users buying . . .

Steel people believe that a turn for the better is close by. Many small users have completed their inventory corrections and currently are buying again. Stocks of many miscellaneous consumers are regarded as dangerously low.

Some steel customers, in fact, are operating with no inventories at all—waiting until they get an order and then putting in a rush request for steel.

Automobile companies still are living largely on accumulated tonnages that they acquired during the model changeover season. As one steel man puts it, "they piled up large stocks before they could shut off the tap." But they should be back on sizable tonnage release schedules in the second quarter.

Steel warehouses report that their stocks are at about an eight-months' level compared with a normal five-to-six months'. Some jobbers say that a small but steady improvement has set in. Others merely go so far as to say that the decline has stopped.

Foundries look to April . . .

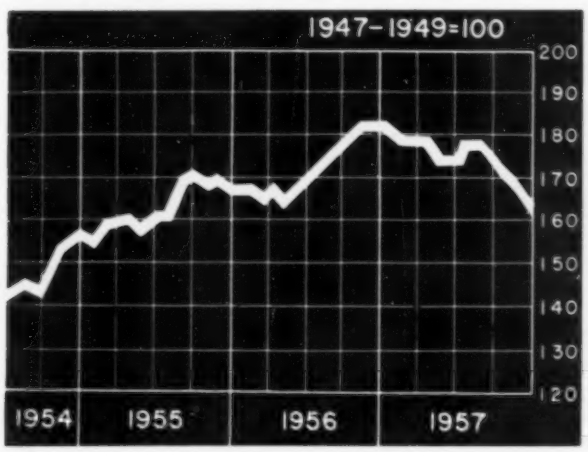
Improvement in new orders for gray iron castings has been spotty. If Metalworking in general is to pick up in the third quarter, foundries will begin to feel the effects by April. Recently the gray iron foundry industry has been operating at about 57% of capacity.

The volume of orders for steel castings continues to taper. A large portion of the steel foundry business is tied to railroad cars. Bookings by railroad equipment companies have been slim.

Steel foundries are looking for relief to the coming road-building program.

Shipments of steel castings last year were close to the 1956 total, but reached their peak in May and have been on the downgrade ever since.

Cold weather, floods, normally slow sales in the winter and conservatism by buyers have resulted in only a fair volume in farm machinery, slow demand for farm tractors and a dullish situation in construction machinery. Spring is expected, however, to bring a gain in all of these areas. Outlook for farm equipment sales in particular is reasonably good. Dollar volume this year probably will equal last year's.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

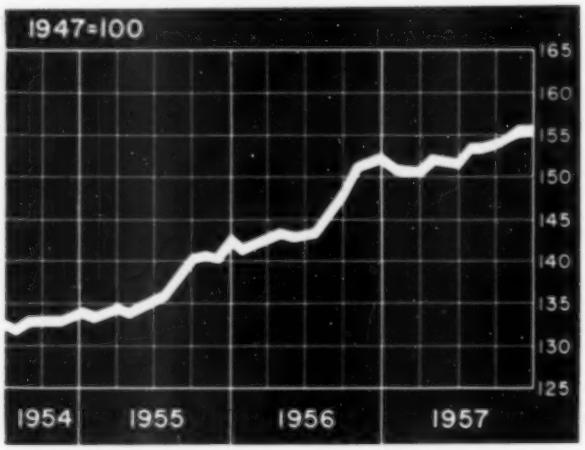
	JAN. Estimated	DEC. Preliminary	NOV. Revised	DEC. Year Ago
Total Index	**161**	**164**	**169**	**182**
Machinery	138	142	155	
Electrical Machinery	194	199	218	
Autos	138	149	149	
Other Transportation	295	292	347	
Other Metalworking	142	145	145	

TRENDS

WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JAN. Estimated	DEC. Preliminary	NOV. Revised	DEC. Year Ago
Total Index	**156.1**	**156.0**	**155.9**	**150.5**
Metalworking Machinery		**183.0**	**183.0**	**174.4**
Other Machinery exc. Electrical		**166.1**	**166.1**	**159.0**
Electrical Machinery		**157.1**	**157.0**	**151.4**
Fabricated Metal Products		**146.6**	**146.5**	**143.3**



Tough going until second half '58...

The American economy faces tough sledding during the next few months. But a substantial, if gradual recovery should mark the second half of 1958.

During the first half the Federal Reserve industrial production index will average as low as 133, unemployment at least as high as 4.5 million. The averages for the corresponding period last year were 144.5 and 3.0 million.

By the end of the year, though, industrial production will again be nearing the 140 mark.

Major factors underlying the current decline have been the sharp drop in orders for capital goods and the virtual standstill in defense contract letting that marked the last half of 1957.

Reduced demand for producer and military goods touched off large-scale inventory rundowns. Gross national product fell at an annual rate of $6 billion from the 3rd to the 4th quarters. About 5/6 of this decline was accounted for by a change from a $2 billion annual rate of inventory accumulation to a $3 billion annual rate of inventory run-off. Inventory unloading led to production cutbacks and worker layoffs.

Factors which will put a floor under the decline and bring about recovery shape up like this:

- **New orders for military hardware** will total $10 billion during the first half. The figure for the last six months of 1957 was $5.4 billion. These new contracts should begin to show up in increased production by the latter half of the year.
- **Easier credit may prove a tonic to business,** particularly construction. New housing starts will increase 5% this year as compared to 1957.
- **Personal consumption expenditures** will remain at a high level since automatic wage hikes for several million union workers and unemployment compensation for the majority of the jobless will prevent a tailspin in personal income.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	127.6	128.3	151.1
Steel ingot operation (thousands of tons)	1,449	1,457	2,501
Electric power output (million Kilowatt hours)	12,289	12,238	12,019
Production of automobiles and trucks	132,880	130,961	179,776
Engineering construction awards (Eng. News-Record—millions)	$208.7	$322.9	$311.6

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	136	139	147
Index of durable manufactures production (1947-1949=100)*	148	153	167
Durable goods manufacturers' sales, millions*	$13,076	$13,548	$14,526
Machinery manufacturers' sales, millions*	$ 3,993	$ 4,175	$ 4,241
Durable goods manufacturers' new orders, millions	$11,588	$12,434	$14,543
Machinery manufacturers' new orders, millions	$ 3,497	$ 3,724	$ 4,127
New orders for non-electrical machinery (1950=100)*	122	121	131
New contracts for industrial construction (1950=100)*	80	103	199

* Seasonally adjusted

Over $1,000,000 a year

saved with OILITE Precision Parts

This kit contains intricate parts used by a score of companies who save over $1,000,000 annually by specifying Oilite*!

These companies are typical of many manufacturers of appliances, machinery, automotive accessories, power tools and other products who enjoy the substantial cost reductions made possible by Amplex Powder Metallurgy.

You, too, can have a share in these savings. Chrysler-engineered Oilite Precision Parts can save you up to 55% or more when produced in volume. What's more, you'll find Oilite powder metal parts tough and long wearing. They're available in a large variety of metals and alloys to meet required properties.

Your local Oilite Engineer will be glad to provide complete information on any application. Furthermore, he will gladly survey all the parts you now buy for possible cost reductions *at no obligation*. Look for him in the Yellow Pages of your telephone directory under "Bearings — OILITE" or write to Dept. A-2.

Engineers in the principal cities in US and Canada.

TYPICAL PROPERTIES OF STEEL OILITE* PRECISION PARTS

(Grades)	A	AC	AH
Fatigue Strength (Psi) 10,000,000 reversals	24,000	-----	------
Ultimate Tensile Strength (Psi)	35,000	50,000	120,000
Compressive Strength (Psi) .001" permanent set	25,000	80,000	150,000
Elongation in 1", % minimum	10	5	1
Brinell Hardness	80	140	300
Shear Strength (Psi)	27,000	35,000	100,000

* Many other materials giving different properties available.

A CHRYSLER PRODUCT OILITE SINCE 1920

the most trusted name in powder metallurgy

AMPLEX DIVISION

CHRYSLER CORPORATION, DETROIT 31, MICHIGAN

BEARINGS • PRECISION PARTS • METAL FILTERS • FRICTION UNITS

* REGISTERED TRADEMARK • ONLY CHRYSLER MAKES OILITE.

How Armco 17-4 PH Stainless gives shafts longer life at low cost

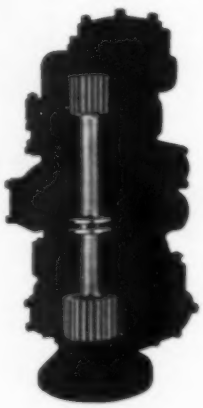
Armco 17-4 PH Stainless Steel is specified for shafts like these because it provides an unusual combination of high strength and hardness, good corrosion resistance and excellent fabricating characteristics. Where operating conditions are severe, designers have found this special Armco Stainless Steel assures economical and long, unfailing service.

High Strength Plus Corrosion Resistance

Mechanical properties of 17-4 PH show why it can be used to make shafting and other critical parts stronger, more resistant to galling and wear.

Typical Properties Armco 17-4 PH Bar (Hardened at 900 F for 1 hour)

Ultimate tensile strength, psi	180-210,000
0.2% Yield strength, psi	165-200,000
Elongation in 2", %	8-17
Hardness, Rockwell	C40-45
Endurance limit, psi (100 million cycles)	80,000



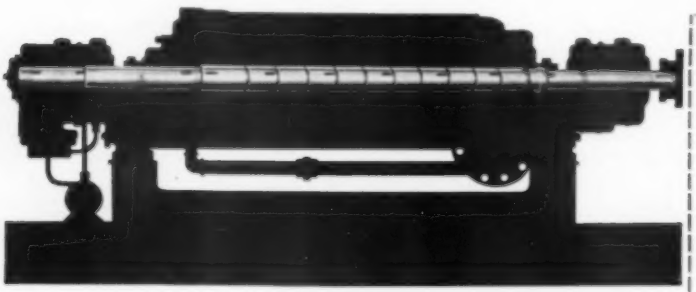
Excellent properties up to 900 F also extend the advantages of 17-4 PH to elevated-temperature applications.

In addition to high strength, this special stainless offers good corrosion resistance. It is much better than that of the hardenable chromium grades and as good as Type 302 under many conditions.

Simple, Low Cost Fabrication

Armco 17-4 PH is readily machined, forged or welded. Hardening requires only 1 hour at 900 F. This low temperature heat treatment, by eliminating scale and minimizing distortion, permits most parts to be finish-machined before hardening.

For parts of *your* products that require ultra-high strength plus corrosion resistance, consider the many design and production advantages of Armco 17-4 PH Stainless Steel. It is available in bar, wire and billets. Just fill out and mail the coupon for complete information.



ARMCO STEEL CORPORATION
1528 Curtis Street, Middletown, Ohio

Send me information on Armco 17-4 PH Stainless Steel

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ARMCO STEEL

ARMCO STEEL CORPORATION, 1528 CURTIS STREET, MIDDLETOWN, OHIO

SHEFFIELD DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

American Machinist
MAGAZINE OF
METALWORKING PRODUCTION • ESTABLISHED 1877

No Excuse For Shoddy Products

Millionths-of-an-inch no longer is merely a dream in the metalworking industry. It is a reality.

Precision manufacture has taken giant strides. Tolerances unattainable not long ago are now being specified and met. Defense requirements, with their elaborate and exacting control and communications systems, deserve much credit for this progress.

Critical military items dare not fail in performance without imperiling human lives. That is an excellent reason why manufacturing and inspection standards for military items are so meticulous. These standards are continually getting to be more exacting.

The opposite is happening . . .

in many metal products. Standards appear to be slipping just when they should be going up. Unless drastic action is taken to halt the present trend, they may go lower.

Take today's automobiles. At least some of them represent poor workmanship and sloppy assembly methods, one of our readers writes us. As a car owner, he feels that he is a victim.

He refers to the skimpy paint jobs, misaligned exterior body parts, quick-rusting chrome plating on bumpers, recurring mechanical troubles. How often has a car repairman reminded you that cars are not made the way they used to be? A lot of car owners agree with him.

In consumers' complaints about shoddy products, the automobile people have plenty of company. Household products are high on the list—poor kitchen equipment, frail and slapped together appliances, flaky and hair-thin chrome on plumbing fixtures. Few products have really smooth outer surfaces. The shorter the life of these metal goods, the sooner they will have to be replaced.

This is an unsatisfactory situation . . .

which should not be tolerated. Do metal manufacturers ever stop to think that metals are not the only materials in the world? Consumers do not have to put up with deteriorating standards in metal goods. They can turn to wood, plastics and a wide variety of synthetic materials.

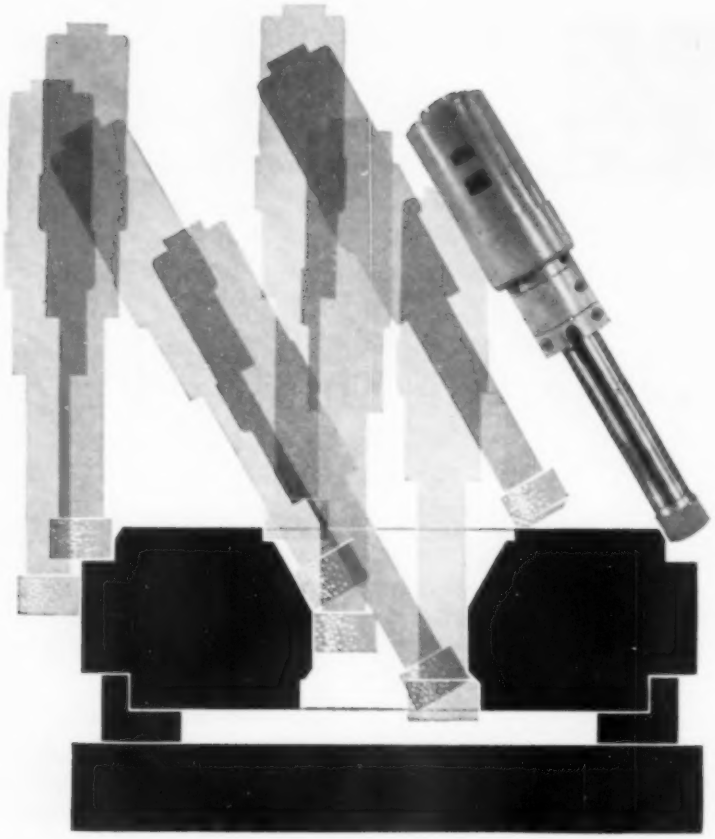
Metalworking shops are capable of performing to high standards. Mechanical perfection and rigid production specifications are characteristic of day-by-day operations in thousands of metalworking plants.

There is no excuse . . .

therefore for tolerating the existing laxity in many establishments making consumer goods. It is time that offenders halt the creeping deterioration of their standards and of their performance. The way to halt it is to set up quality-control principles to which the entire organization should adhere.

Such action, which is badly needed, would help to restore good workmanship and would insure a better product to the user. It would promote good business and broaden markets for metal goods of all kinds.

Burnham Finney EDITOR



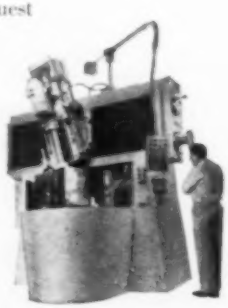
ONE SET-UP: NINE JOBS. Sectioned workpiece shows the flexibility of a Springfield Vertical Universal Grinder.

Grinders that provoke thought

The above diagram illustrates one feature of a relatively new type of grinding—vertical universal grinding. It has captured the imagination of several astute missile and automotive production men, because up to now few people even thought about grinding *that* way. The diagram shows 9 grinding operations on a work piece with one setup of a Springfield Universal Grinder. This is a standard machine, not a special. Springfield has been making such grinders for 11 years.

Gravity works for the operator; the workpiece is held on a horizontal face plate. The grinding spindle (or spindles) is rigidly mounted, but easily positioned. Control is electro-hydraulic. On more elaborate machines automatic sizing and cycling are common features.

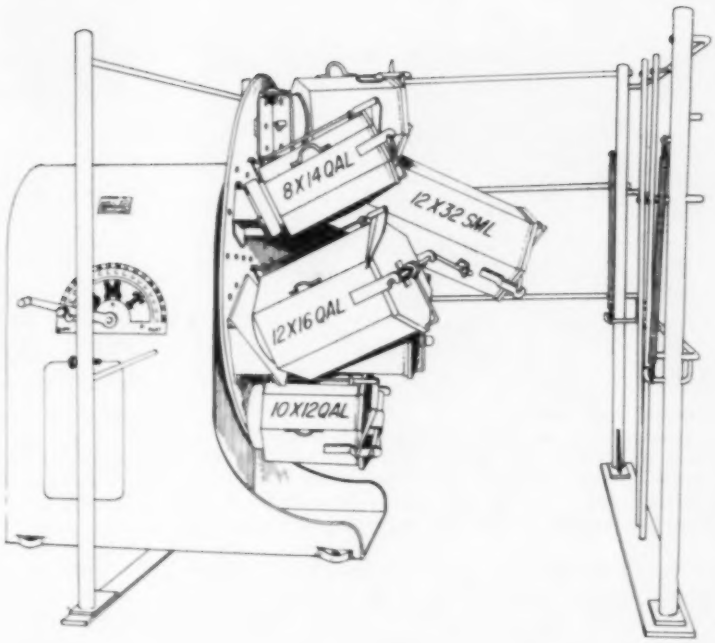
Because of the profit potential to you, The Springfield Machine Tool Company would like you to study a booklet on the principle of vertical grinding. And we especially would like to talk with you about vertical contour grinding. Request Bulletin 197A.



The Springfield Machine Tool Company, Springfield, Ohio

MAKERS OF ENGINE AND TOOL ROOM LATHES AND VERTICAL UNIVERSAL GRINDERS

SPRINGFIELD



Slide honing uses small angled barrels . . . that make the parts slide more than they tumble. Faceplate rotates at 15-45 rpm, and will carry any combination of loads that will work at the same speed. Barrels carrying parts going through short runs can be emptied, then the run continued for other barrel loads

Slide takes the curse out of tumbling

Conventional tumbling removes burrs and smooths up rough castings, but it may bend thin parts, roll over extruded metal into holes, and impinge critical surfaces. A relatively new technique called "slide-honing" has been developed by BMT Mfg Co, Elmira Heights, NY. It confines parts to sliding and rolling actions that remove stock accurately, without danger of damage

CHARLES EMERSON, associate editor

Barrel finishing has become a precision operation that can be closely controlled and varied, and will do much more than simply knock large burrs off the corners of castings and machined components. If the many influencing factors are balanced, barrel finishing can be applied to produce a given radius, improve surface finish to any desired fineness (short of polished quality), and remove given amounts of stock on both internal and external surfaces.

The term "slide-honing" was coined to indicate that the operation uses sliding friction, not impact, to remove metal. This refinement of conventional barrel tumbling depends partly on the barrel equipment, partly on the choice of abrasive compound and chips, and most importantly on the skill and experience of the operator in controlling the many possible variables.

EQUIPMENT

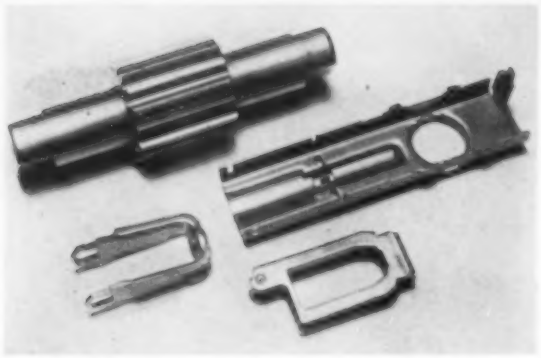
Instead of loading parts into a fairly large barrel where they would tumble freely, the operator uses a machine with a large-angled, rotating faceplate fitted with a number of small-diameter barrels. Barrels may be mounted straight or at an angle to the faceplate, depending on action desired. Angle mounting increases the tendency for parts to move inside the barrel.

Parts are loaded to fill the barrel more fully than in conventional tumbling. Parts will therefore slide from one end of the barrel to the other as the faceplate rotates.

Depending on size, shape, weight, and contour of the parts, barrels of larger or smaller diameter and length may be assembled to the faceplate. For long, thin parts, for example, a long, thin barrel will allow repeated sliding action, coupled with slow rotation or rolling within the barrel, which repeatedly changes contacting surfaces and edges. Because there is little if any true tumbling, parts will be in little danger of distortion, even if they are thin and delicate. If heavier action is desired for rougher parts, a larger barrel will allow some limited conventional tumbling along with the primary sliding action.

CHARGING

Suitable compounds and chips for slide-honing have only recently become available in many sizes and grades. Because of the many possible variations in the charged load, no complete set of rules to cover all cases can be developed. Just in the choice of chips the operator has a wide range of possibilities. Square, rectangular, double-conical, round, triangular, and other shapes can now be purchased. Sizes range from about ¼ in. long to several inches long. Materials range all the way from hard metals and ceramic mixes to rela-



Stamped lock parts . . .
are slide-honed to save 2/3 in deburring time and improve product quality. The three parts are heavy sheet stock, but conventional tumbling damaged them beyond repair. Slide-honing technique is used by Schlage Lock Co, San Francisco, to fill the gap between conventional tumbling and skilled hand deburring

Chips—or media—range in size . . .
from these up to pieces 2-3 in. long, and in texture from stone hard to rubbery soft. Choice of chips was a major problem in developing slide-honing technique, but sizes, materials, shapes, and weights in all variations are now becoming available

tively soft natural and synthetic textures. Weights vary with material and size, and the relative mass of chip material may be taken into account when certain effects are desired. A small metal chip, for example, will penetrate holes in the work to knock off inside burrs; or a light, soft ceramic will merely polish the outside surfaces.

Vitrified aluminum oxide is the conventional chip material, but is by no means the only one available.

COMPOUND

The key to good barrel finishing is the tumbling compound, which is of acid, alkaline, or neutral characteristics. The compound originally contains no abrasive powder, which is added in the quantity and grade required for each given finishing job. Abrasive should be added to the compound liquid when work is about to start; otherwise the mixture would tend to settle and become unblended in shipment and storage. Separate compound and abrasive stock also allow better inventory control than premixed compounds that include abrasive.

Compound has seven important effects on slide-honing action:

First, it **conditions** the water to prevent formation of salt deposits. Insoluble lime soaps and other deposits that form in hard water will coat the chips, parts, and barrel surfaces. If the parts become coated, they are naturally ruined, or have to be cleaned with another compound (usually high-alkaline) in a separate operation. Coated chips—or media—will not have the required abrasive action, nor will barrels with inside surfaces coated. Compound also includes strong ingredients to dissolve any deposits that have already formed, and for this reason the chips are sometimes tumbled freely in pure compound for cleaning.

Lubrication is the main function of the compound. High lubricity means a low cutting rate, and vice versa. High lubrication brings out more color and luster on the work. Concentration of the compound in the water controls the degree of lubricity. If an acid compound is being used to descale and cut the work, lubrication is not required, so acid compounds should be formulated for this effect.

Sudsing in the barrel is important because suds carry off the particles of media and work that are broken off during tumbling. These particles should be suspended in the work zone, and not allowed to deposit in the barrel. The type of suds is more important than the volume of suds—suds should be tough, thick, and long-lasting to convert the entire liquid part of the work zone into a sudsy mass. Suds particles should be minute and able to maintain a uniform film between media and work. Suds also cushion impact and reduce physical damage to parts.

Suspension of these small particles of media and ground-off work metal is necessary so the particles cannot become concentrated in any section of the barrel. All particles developed during a work cycle should be kept in suspension at all times.

Scale removal may be a critical problem if the parts are just out of heat-treat or are rusty. Light scale and rust can be removed with an alkaline compound with added loose abrasive. Heavy scale and rust may be removed with an acid compound—with or without added abrasive. After parts have been tumbled in an acid compound, it is important to neutralize the load with an alkaline compound so parts will not rust upon being exposed to air.

Cleaning ability is another necessary factor for the compound. A slide-honing cycle should be started with clean parts and clean media, but there is always residue that can be removed from the work. The compound must also prevent dirt from redepositing on the work.

Rinsing effect in the compound helps speed up the whole tumbling operation because time will not be wasted cleaning parts after the barrel cycle.

MEDIA

Use large media for rapid burr removal, provided finish is not important. Use small and "broken-in" (used before, and worn down) media for a smooth finish and slow cutting. Also use small media on fragile parts.

Pick the media size so it will not tend to lodge or plug in slots and holes. If you want the media to penetrate the holes, as well as smooth the outside

surfaces, use about 25% large and 75% small media —picking each size to do its own specific job.

WATER

When the materials—parts, media, compound, abrasive—are loaded into the barrel, the water level can be adjusted to change or control the action. If fast cutting is desired, the level should be 1-3 in. below the level of the mass in the barrel. If burnishing is required, the water level should be even with or 1 in. above the mass. Always start with clean water with its Ph as near neutral as possible. Don't hold a load overnight or for a long time without action—Ph can climb several points overnight.

HOW TO APPLY THE RULES

With so many variables in abrasive, compound, work shape and size, barrel shape and size, and so on, there is obviously a certain amount of art involved in producing good results. Usual practice is to take the recommendations of the machine builder, the abrasive supplier, and the compound manufacturer, and then to vary one or two factors until a trend can be recognized.

Once a time cycle is established for a given operation, it should be held fairly closely. Compounds will break down within a period of time—reaching a peak of efficiency at a given point, then losing efficiency until they start allowing the parts and media to contaminate. Thus, other factors should be changed before the time cycle ends.

Rapid work handling is promoted by high pressure in the water lines. Automatic hosenozzles save time when the barrel is flushed.

Parts should be loaded in layers with the media. This prevents nicking and also starts off the load with a fair distribution of working elements. Careless dumping will also cause nicks; sometimes a funnel-shaped bag or "boot" can be applied to ease the load out of the barrel.

If the parts are degreased before tumbling, cutting action will be faster and better in the barrel. Grease and oil act as lubricants, naturally, and they also contaminate the abrasive, barrel, and parts.

Barrel lengths and diameters can be chosen with this rule: Diameter or width should be 2/3 the length of the part; length should be 2-4 in. longer than the part to allow sliding. This rule is only for slide-honing with an angle-mounted barrel, and may not apply to conventional tumbling.

Parts may sometimes be mounted on longitudinal brass rods inside the barrel and allowed to slide back and forth to remove burrs inside through holes or slots. Abrasive slurry is loaded to provide cutting action.

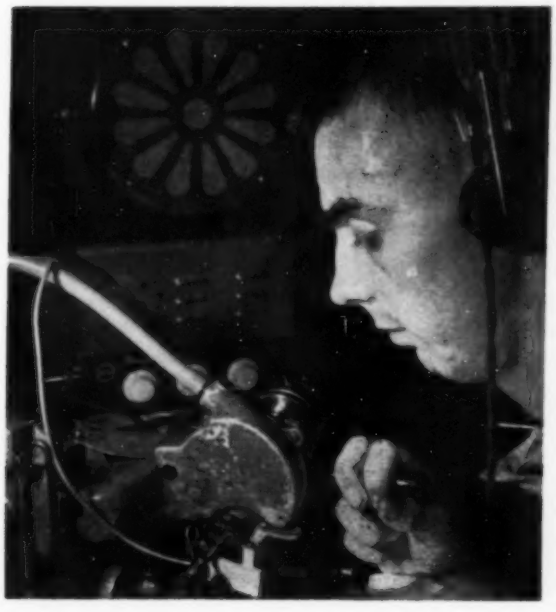
When parts tend to tangle or bunch up in the barrel, a stationary rod down the middle of the barrel will help keep them separated.

Once in a while the barrel size and shape may be just such that the parts will jam completely. Parts may jam together and lock, or they may simply jam across the width of the barrel. Such cases are impossible to predict, and they can only be avoided by trial and error. The solution is usually a larger barrel width.

Much of this sounds like cut-and-try, and much of it is. But each trial and error establishes a pattern that outlines what can and should be done.

High-fidelity burnishing

JOHN DOW, superintendent of manufacturing, AERONAUTICAL DIVISION, MINNEAPOLIS-HONEYWELL REGULATOR COMPANY

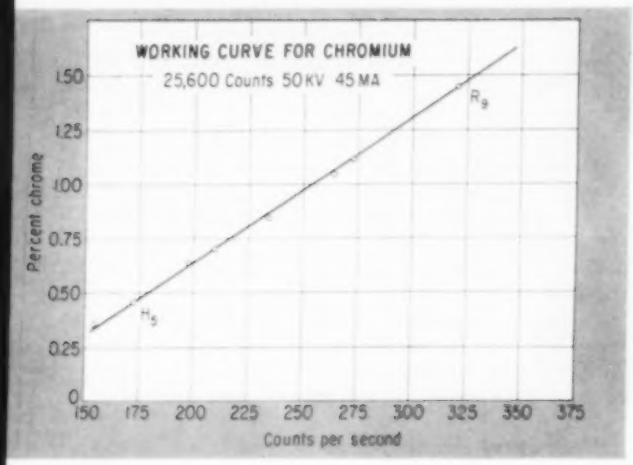


The man with the earphones is listening to an audio signal that tells him when the roller-burnishing lathe in front of him has achieved the desired finish on precision shaft journals. The noise level decreases as the finish of the shaft improves.

At Minneapolis-Honeywell's Aeronautical Div, where this is a standard operation, most of the small shafts for aircraft control devices must be finished to extremely close tolerances on size, concentricity, and finish.

To achieve these tolerances, and to develop hard, long-wearing bearing surfaces, precision-ground journals are finished with cemented-oxide-faced rolls where normal finishes are acceptable. Here, "normal" means 4 to 10 mu-in. The super-smooth shafts, requiring finishes down to 2 mu-in. on the journal surfaces, are burnished with cemented-tungsten-carbide-faced rolls.

The burnishing rolls vary in size, but most are 2¾ in. OD with a ⅜-in. face width. Operating speeds are slower than normal because of the precision tolerances and finishes required. The average is 700 rpm for the roll and 550 rpm for the workpiece.



Working curve . . .
for chromium content is plotted for comparison with a standard established by chemical analyis

X-ray spectrometer . . .
requires very little room, is not "delicate" in the laboratory sense. Chemist is inserting an unknown specimen prior to running a pulse count to determine specific quantities of each element in the metal

X-rays speed inspection of raw stock

By VERN W PALEN
PHILIPS ELECTRONICS, INC.
MOUNT VERNON, NY

To keep up with the increasing demand for close control of incoming stock, X-ray diffraction is supplementing chemical analysis. Time is cut 80%

Buyers of fasteners are getting more and more finicky about high strength and performance. Fastener makers therefore must pay more attention to the quality of the materials they buy. But chemical tests to verify the quality of incoming materials created a serious bottleneck at the Holo-Krome Corporation, Hartford, Conn.

An X-ray diffractometer-spectrograph solved the problem. Now analysis is five times as fast as with the old method—thus saving 80% of the chemist's time. The X-ray technique provides greater accuracy and, once procedures are established, unskilled personnel can do much of the routine work.

All products are forged from special-analysis alloy steel, and threads are held to exacting Unified-3A thread fits. Raw materials are received at the plant as wire coils or round bars. (Wire stock varies in diameter from 0.052 to 0.750 in. and bars from 0.050 to 3.0 in. Metal used in stock through ½ in. dia is AISI 4037 steel; above ½ in. diameter it is AISI 4137 steel, containing approximately 1% chromium.)

First, raw stock is cut to the proper length at the "headers," and then a button or cap is forged on one end. These machines also forge the hexagonal socket. Next, the screws go to the "trimmers" for facing and pointing. Roll threaders then apply the threads. After inspection, screws are heat-treated and packed for shipment.

RAW MATERIAL ANALYZED

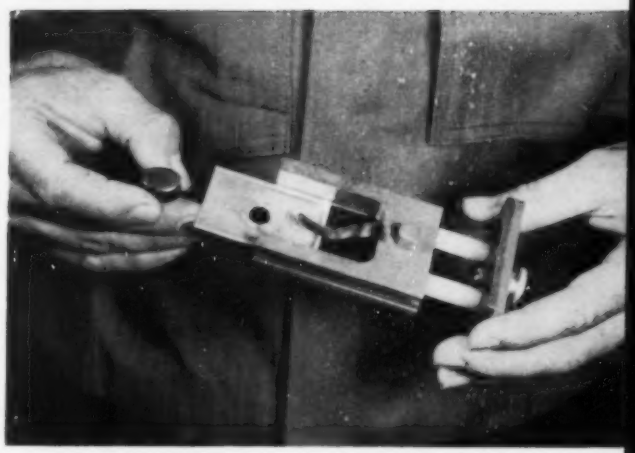
When raw material is received, the X-ray spectrograph determines the exact quantities of chromium, nickel, manganese and molybdenum present in wire and bar samples. In the alloys purchased by the company, the four elements lie within these percentage limits: chromium (exclusive of stainless)—0.05 to 1.5%; nickel—0.05 to 3½%; managanese—0.05 to 1½%; and molybdenum—0.005 to 0.5%.

Raw materials for socket-screw products must meet strict specifications, or it is impossible to develop the desired mechanical characteristics in the screws when they are heat treated. For this reason, one sample is taken from every seventh coil of wire in a shipment and two samples are taken from every 2500 lb of bars. Pieces 6 to 8 in. long are cut off and forwarded to the metallurgical department for analysis. Then acceptable coils are tagged and racked for production.

The metallurgical department cuts pieces approximately ½ in. long from the 6-to-8-in.-long raw-stock samples. These pieces are flattened in a press to enlarge them enough to cover a ⅜-in.-dia hole in the specimen holder. Flattening is not necessary when stock is large enough to cover the hole.

Holo-Krome technicians altered a standard Norelco specimen holder to accommodate these specimens. The top-plate section of the holder was removed and grooves

Raw stock . . .
for smaller sizes is received in coil form. Tester cuts 6 to 8-in. length from coil for use as a sample



Adapter . . .
was added to standard Norelco specimen holder to accommodate special samples of stock. Diameter of screw stock is frequently smaller than instrument normally uses

were milled in each side to receive a special aluminum plate with a $\frac{3}{8}$-in.-dia hole in its center. The side of the hole is beveled on the collimator side to get maximum reflection intensity. If the hole had no bevel, plate thickness would cut off some reflected rays.

After the specimen is flattened, one side of each specimen is polished, when necessary, with No. 1 emery paper. Polishing, at 90 degrees to the marks left by the cut-off machine, continues until these marks disappear. Then the specimen is placed under the hole in the holder and is held by a spring finger. The specimen is rotated so the marks left by the emery paper are parallel to the reflected beam, because this position produces maximum intensity.

Now the holder and specimen are placed in the X-ray spectrograph. This instrument is set up to operate and stop automatically when a fixed number (25,600, for example) of pulses have been reflected from the specimen. In a very short time this operation is completed, and the time in seconds is recorded on a meter. Each sample is analyzed three times to get an average that gives greater accuracy. By comparing this average for the unknown material with that of a known material, the operator can determine what percentage of each element is in the unknown.

Test standards, to give a known sample, are made from the raw stock received from suppliers. About 25 standards are sufficient for all Holo-Krome X-ray analysis work. Element percentages for these standards are determined by chemical analysis. Elapsed time for a fixed number of X-ray counts is then recorded for each element. Dividing total counts by time gives count-per-second values, which are equated to percentages.

The graph shows how a group of chromium standards is handled. The vertical scale (y) is the percentage of chromium and the horizontal scale (x) is counts per second. From chemical and X-ray data previously obtained, eight chromium standards are plotted and a sloping line is drawn to fit the points as closely as possible.

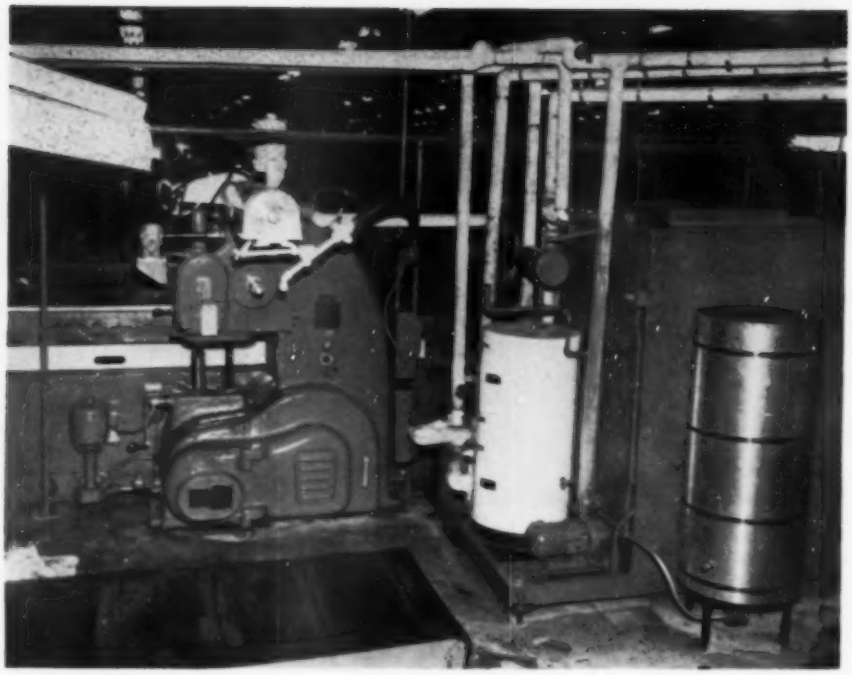
PROCEDURE ELIMINATES ERRORS

Holo-Krome has found that counts on some standards may vary from day to day. To avoid error, technicians follow a special procedure in the daily X-ray tests.

Time in seconds (for 25,600 counts, for example) is taken three times on the two standards to be used. Three values (68.0-69.1-69.1) are averaged (68.7), and 25,600 is divided by 68.7 to give 372.2 counts per second. Similarly, the other three values (109.7-108.1-108.8) are averaged (108.8), and 25,600 is divided by 108.8 to give 235.0 counts per second. Values for y_1 and y_2 are available from the chemical analysis.

The first equation on the sheet is solved for m, which here equals 0.00543. This figure is used in the second equation. Thus, the percentage of chromium in an unknown is equal to counts per second on the specimen times 0.00543, less 0.581. This is how the values are obtained. Although this procedure may seem difficult to the layman, it is quite simple when understood. It is a much faster way to obtain element percentages than any other known method.

Holo-Krome plans to apply the X-ray diffractometer-spectrograph to other problems in the near future. This instrument will probably be used for raw material control on stainless steels and tool steels. The diffractometer will help in orientation studies of raw materials; in transformation studies on heat-treated tools such as header dies, inserts, and fingers; and in checking the causes of failures.



Cooling equipment and reservoirs . . . have heat-transfer capacity to handle two platens at once. Milling machine is operated normally except that platen has special base to hold water and coolant is really cold

Quick-frozen water clamps honeycomb for machining

Ice platens clamp metal and plastic honeycombs for conventional, electrolytic, and spark machining. New equipment that will complete a clamp-unclamp cycle in 8 min works faster than water-soluble adhesives, improves machining accuracy, and will even set up such materialsas felted or woven fabrics for cutting

H H POWELL, mfg research & development, Convair Div, GENERAL DYNAMICS CORP, FT WORTH

Ice clamping is a widespread practice where such delicate parts as honeycomb aircraft structures must be machined. A workholding platen is flooded with water after the work is positioned, then the water is frozen to grip the work tightly. Frost usually builds up above the ice line, improving rigidity.

The most popular ice-clamping system uses the platen as an alternate condenser and evaporator in a reversible refrigerating circuit. The system works one way to freeze the water and grip the part, then the other way (after machining) to release the part. But this method requires a high-capacity refrigerating circuit to allow reasonable speed.

An alternate system is the newly developed Zink valence unit, which has separate refrigerating and heating plants that control the temperature of an independent fluid in the platen. A warm reservoir holds defrosting fluid, and a cold reservoir holds freezing fluid (plus a tank for cold cutting oil). Plumbing is arranged so there is minimum intermixing between warm and cold fluids, but two-way valves allow pumping out the cold fluid and replacing it rapidly with warm fluid at the platen.

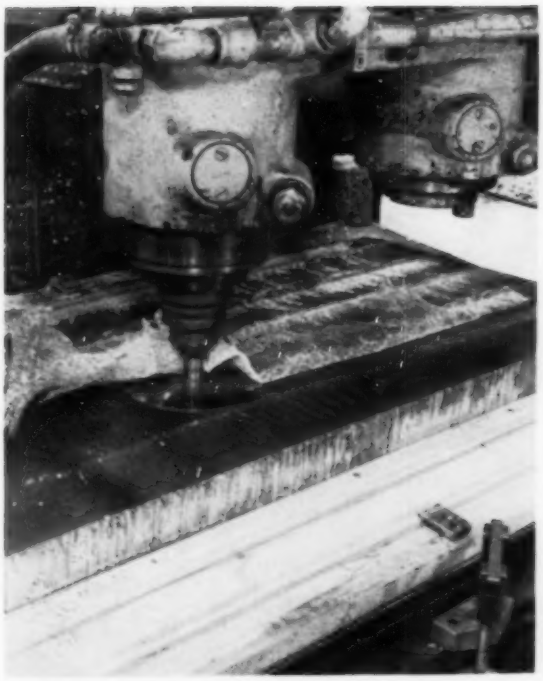
This separate reservoir system allows a complete clamp-unclamp cycle in 8 min. The platen temperature does not have to go below +10 F, so the cold reservoir is held at +5 F. A large amount of cold fluid is always ready for the next cycle. The system handles two ice platens at once.

PLATEN CONSTRUCTION

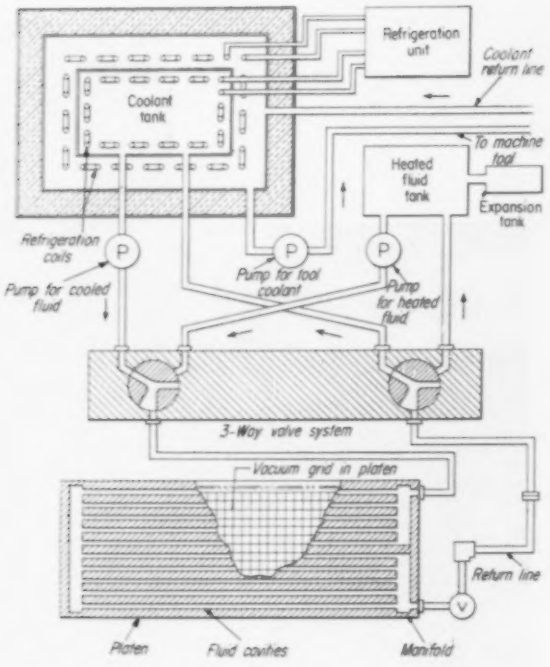
Accuracy tolerance on each platen is 0.003 in., which allows close work. Although the ice holds the parts firmly, lengthwise creep because of cold contraction and heat expansion is possible; but this prevents distortion of the work. The platen was made by milling lengthwise slots, then closing them with a bonded continuous sheet.

This development allows full utilization of concave disk cutters and other cutting tools, even on such unlikely workpieces as plastics. Some of these are more accurately worked at low temperatures, and the ice cold allows buffing without danger of burning. Foamed rubber can be clamped securely by wetting the bottom of each piece and freezing the part on the platen. Metal plates and forgings are milled, drilled and profiled while ice-clamped.

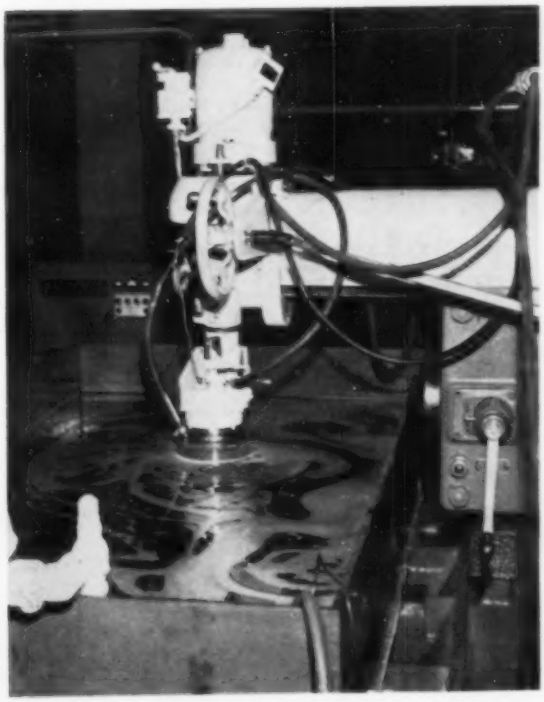
One of the more recent techniques applied with ice clamping is to stress flat blocks of honeycomb, then machine a smooth, flat surface that will revert to a curve when the work is de-iced and relaxed. This illustrates that ice clamping, even when the work is stressed, is a solid support.



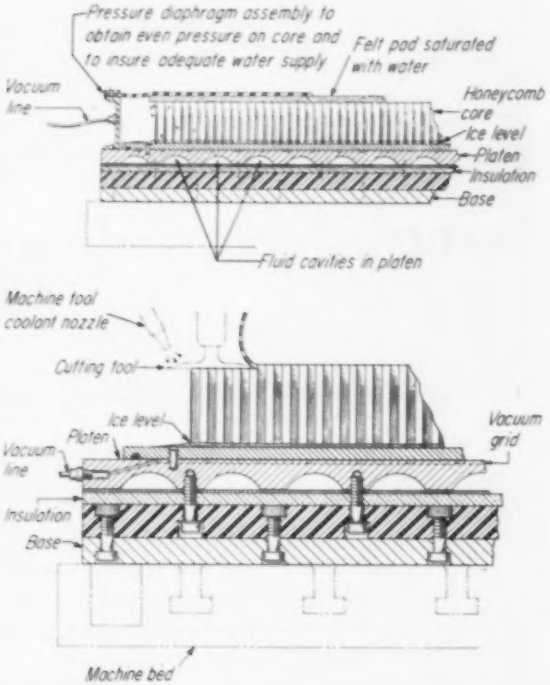
Disk cutting is improved . . .
by frost formation on work, especially on honeycomb and some kinds of plastics. If honeycomb is warped on platen, then frozen and machined, final shape after unclamping will be curved



Zink valence unit . . .
keeps cold fluid in one reservoir, warm in another. Coolant tank in cold reservoir holds cutting oil or special liquid for spark or electrolytic machining



Ice-platen machine . . .
has greater capacity than setup with water-soluble adhesives because ice freezes faster than adhesive sets, and ice can be force-heated by warm fluid to reduce idle time



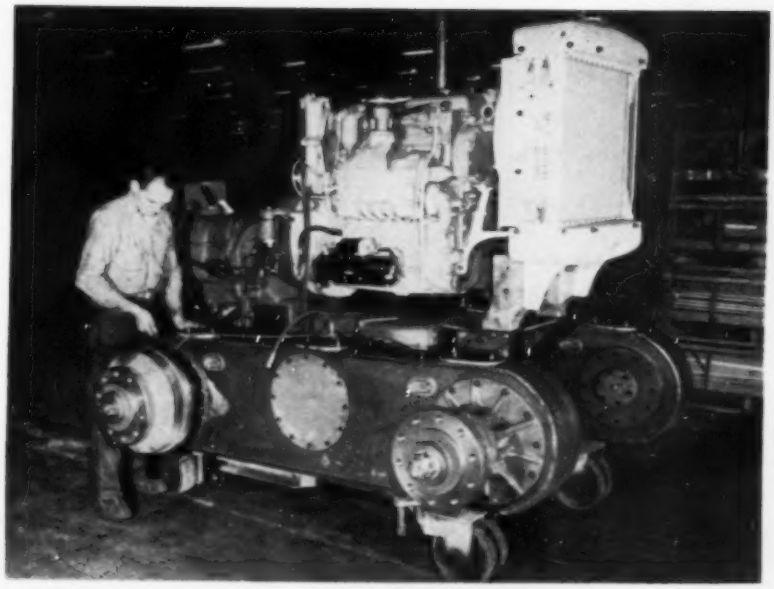
Platen is a maze of cavities . . .
that contains cooling fluid. Vacuum line holds down workholding plate or fixture. Wet pad over work drips water into honeycomb holes to allow complete freezing

Flexible four-wheel drive . . .
in Adams Motor Grader permits operation over difficult terrain. Tandem drive box and wheel assembly on each side is free to pivot about a center mounting

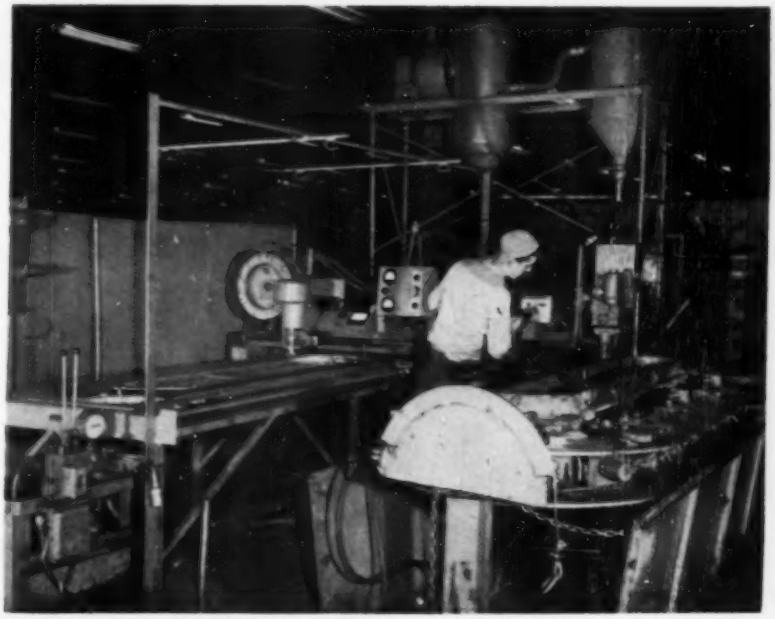
Automatic welding with templet control and nesting fixtures

L E FOUST, superintendent of manufacturing engineering,
HAROLD MOODY, supervisor of methods & time study,
ADAMS DIVISION, LETOURNEAU-WESTINGHOUSE COMPANY, INDIANAPOLIS, IND

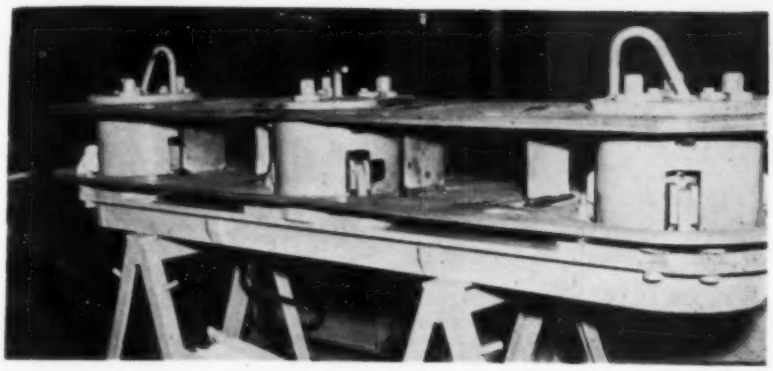
Cost of welding the drive boxes for Adams Motor Graders has been reduced greatly by converting a flame cutting machine into an automatic submerged-arc machine for welding the peripheral joints and by developing novel internal and external nesting-type fixtures to hold formed parts in position while welds are made under tracer control. Principal features of the machine and the fixtures are shown pictorially to speed your reading. . .



1 . . Power unit ready for installation . . . in a Motor Grader. Tandem box on each side has a chain-driven stub shaft at each end for rubber-tired wheels. Sides are made of ½- and ⅝-in. steel plate; top and bottom and curved ends, from ½-in. plate



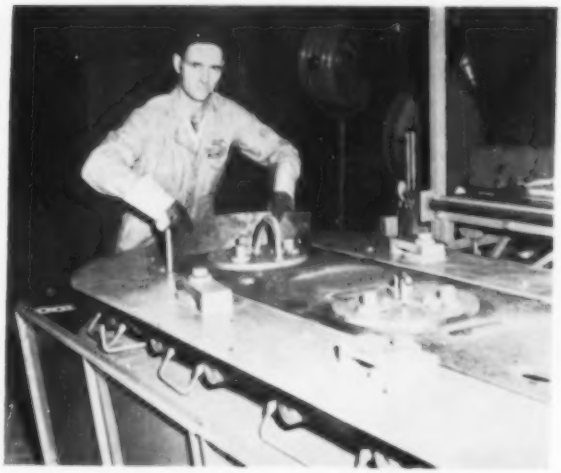
2 . . Tracer-controlled welding machine . . . has Lincoln submerged-arc welding head. Nested fixtures (right) hold drive box from both inside and outside and are trunnion-mounted to provide roll-over. Tracer table (left) has two oval tracks for different-sized assemblies



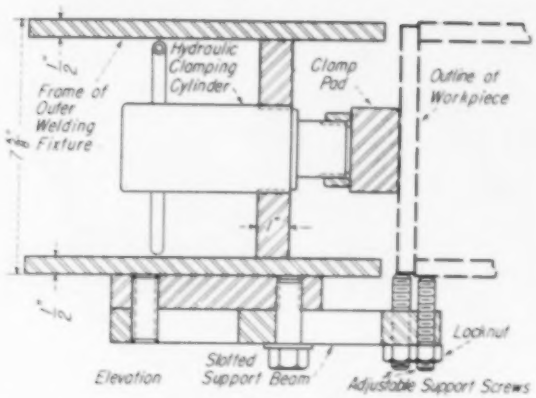
3 . . Assembly starts with side plates . . . which are hydraulically clamped to the three posts of inner fixture. When the side plates have been aligned, four vertical reinforcements are inserted between them and arc welded manually

PLEASE TURN PAGE ▶

Automatic welding with templet control and nesting fixtures . . .

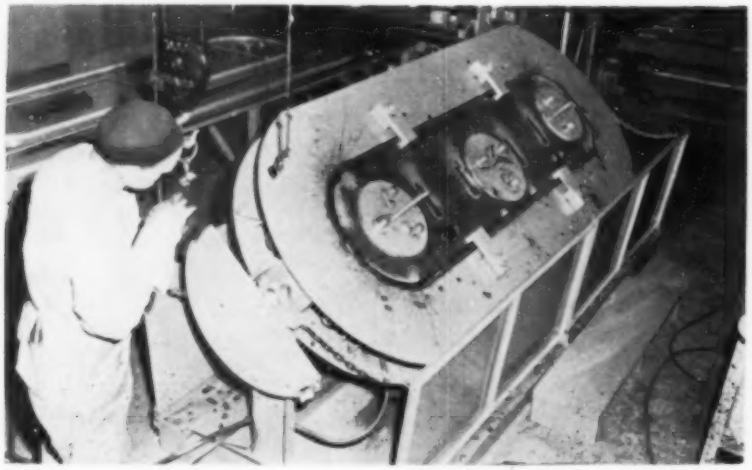


4 . . Operator installs curved end plate . . .
after inner fixture and assembly have been centered in outer fixture. Top and bottom plates are also inserted at this time—at the sides, in this position. Stop screws locate them vertically

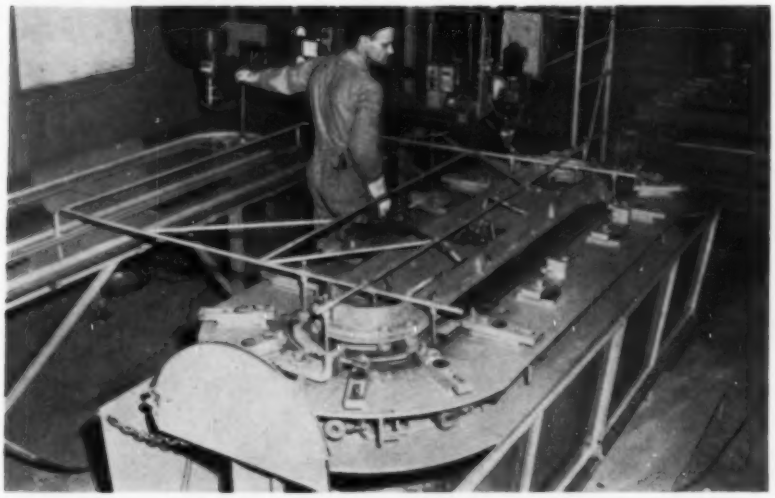


5 . . Outer fixture has 18 hydraulic clamps . . .
and 12 adjustable support screws for holding parts in position during welding. Support beams are slotted so they can be withdrawn when fixture is turned over on trunnions for welding on opposite side. Clamp heads are changed for different-sized boxes

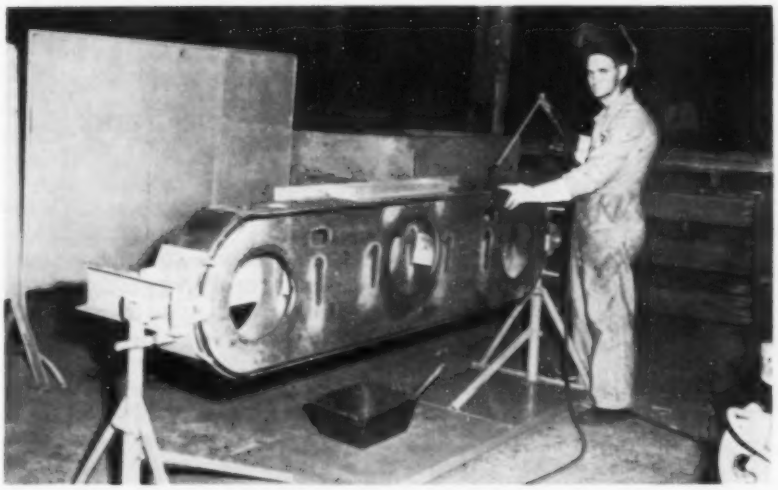
6 . . Templet-controlled machine welds first side . . .
of tandem box assembly with 5/32-in. electrode wire at 650 amps and 34 volts. Welding speed is 25 ipm. Clamps at sides are withdrawn to allow welding head to pass



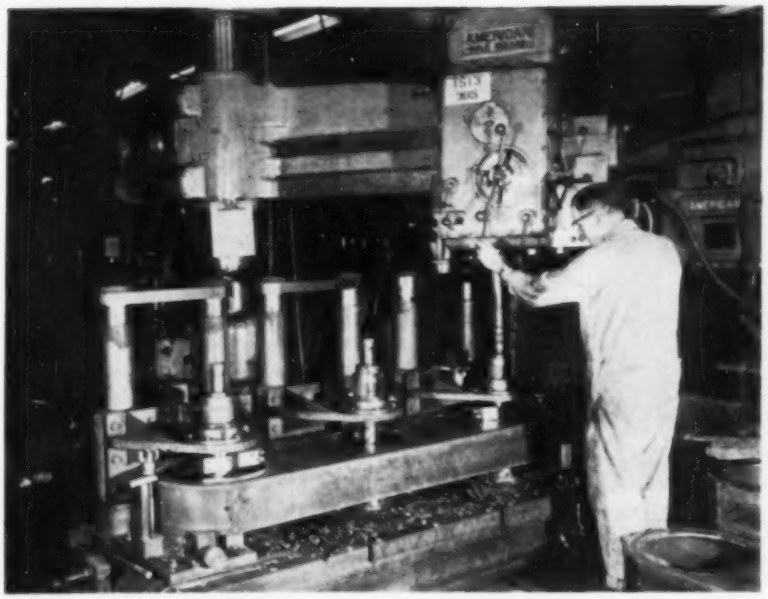
7 . . Inner and outer fixtures are rolled over . . .
after clamps have been tightened to lock them together. Panels at sides keep expended welding flux from scattering over floor



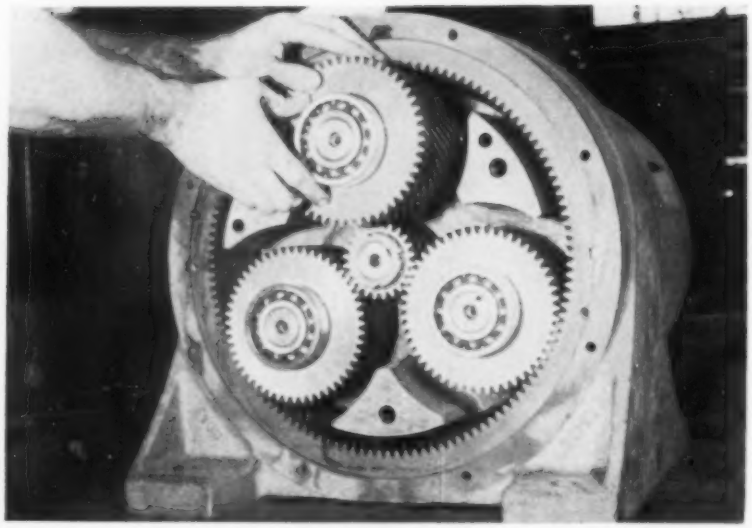
8 . . Tracer and welder are aligned . . . with the help of a bridge gage. Ordinarily, the alignment is performed only when the setup is changed from one size of tandem box to another; it is not necessary for each weld cycle



9 . . Cross joints are welded manually . . . after semi-finished assembly has been moved by hoist from outer fixture and clamped between trunnion supports



10 . . Shaft holes are bored on special fixture . . . attached to radial drill after weldment has been surface ground on both sides. Hydraulic cylinders support slides which position boring heads above workpiece. Shafts of boring heads are machined to fit quick-acting chuck in drillpress



Planet gear slides into position. . .
between pinion and surrounding ring gear of planetary reduction unit. Bearings visible on planet-gear shafts will be seated in a flange which is forged integrally with the output shaft. The flange is then bolted to the triangular columns, called "pie sections." Dowel pins insure accurate position

Careful machining produces planetary

Machines do the work, but it still takes human skill, and experience, and care to produce consistently good parts

RICHARD T BERG,
assistant editor

"If you have a good set of cutting tools and keep them sharp, you can do anything within reason—provided you also have good holding fixtures with no runout and can keep the workpiece from wobbling."

That's approximately the attitude at General Electric Co's Gear Motor and Transmission Components Dept in Paterson, NJ. It also helps, they say, to have experienced employees who can improvise when necessary.

The Paterson plant has been making reduction gears for a good many years, operating as the Watson-Flagg Co until it was purchased about two years ago by GE. During this time, its major product has been planetary gears of all sizes for industrial, transportation and consumer applications.

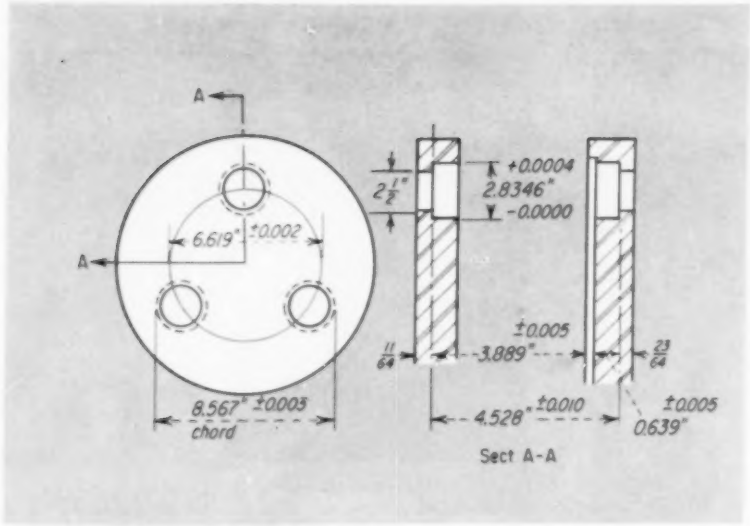
Shaft holes must be in correct positions . . .
so every cage has to pass this check. Plug gages are substituted here for actual shafts, and dimensions are checked all the way around on both sides

SPACING AND ALIGNMENT

The most critical elements in manufacturing a gear of this type are the spacing and the alignment of the planet gears. In a planetary gear, of course, the three planets are supported by the cage. They are driven by the pinion, and in turn, they drive themselves, and the cage, around the inside of the stationary ring gear. If the planets are not equally spaced about the pinion, the gear forces will be unbalanced; one gear will carry more than its share of the load and may run with excessive noise and wear rapidly. The space relationships are established by the cage, so every cage assembly is checked very carefully after it has been machined and before the gears are installed.

The first phase of the checking operation is to determine whether the planet-bearing bores are in the correct locations. In the figure to the left the two parts of the cage have been assembled with gage plugs in place of planet gears, and the man is measuring the chordal distance from one plug to the next. On this dimension he has a tolerance of ±0.003 in., as indicated by the sketch.

But the sketch doesn't tell the whole story. The chordal dimensions *as a group* may vary within that range, but for each cage assembly, all six chordal measurements—considering both sides—must cluster within ±0.001 in. In other words, the first measurement is the only one that has a tol-



Dimensions of typical cage assembly . . .
Chordal dimension appears to have an allowance of ±0.003 in., but it's not that easy; all chords must measure within ±0.001 in. of each other

gears with standard tooling

erance of ±0.003 in. The other five have to be within ±0.001 in. of the first one.

After the cage assembly has satisfied the dimensional requirements, it is checked on parallel bars for alignment. Here, the cage is turned on its side and placed between the parallel bars so that two of the projecting plugs on either side rest on the parallels. Thus, the unit is supported at four points. If it is not perfectly aligned, the operator will be able to "rock" the assembly about the high points, similar to the way a four-legged table rocks on an irregular floor. When that happens, the condition is corrected by shifting one part of the assembly radially with respect to the other one.

In preparation for the exacting requirements of these checks, the preceding operations have to be performed carefully—usually to close tolerances.

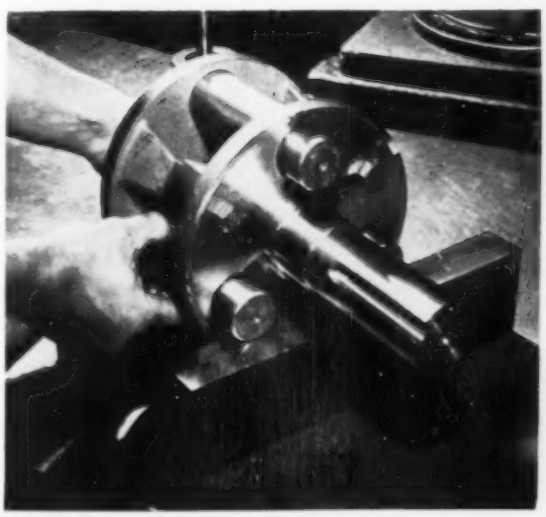
MACHINING

Immediately prior to the checks, the two parts of the cage are drilled and counterbored for bearing seats. Holes up to 3-in. are drilled with twist drills; counterbores are machined with piloted boring bars. Great care must be exercised in this operation, because the counterbore tolerances range from +0.0004, –0.0000 in. on a 2.8346-in. bore to +0.0007, –0.0000 in. on a 4.3307-in. bore.

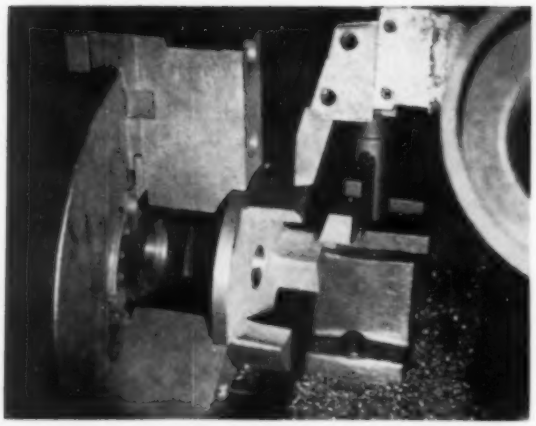
However, close tolerances are by no means the exception at the Paterson plant. The very first machining operations on some of the castings include instances where dimensions are held closer than is normally expected—even by the builders of the machine tools that do the work. For example, the automatic lathes are supposed to work to 0.001 in., but some of the smaller parts here are regularly held to 0.0004 in. in these machines.

Among the larger parts, the cast iron housings probably offer the greatest challenge to the machinist. Because of the tolerances, these parts have to be allowed to cool off between the roughing and finishing operations. It would be impossible to measure them accurately enough if they were distorted by the combined heat of both operations.

Most of the housings are machined on 30-in. vertical turret lathes. Here, one of the critical dimensions is the diameter of a rabbet which fits with the motor housing and therefore establishes the alignment of the two units. The rabbet is held to a tolerance of +0.002, –0.000 in. on diameters that range from about 10 in. to 21½ in. Another precise dimension on these parts is the diameter of the ring-



Alignment is checked on parallel bars . . .
Unit is supported at four points—the two ends of two extending plugs. All four points must be in contact with the bars, or the unit must be adjusted



Cage body is tough on tools . . .
because of interrupted cut and because of abrasive action of cast iron. Nevertheless, this cut is held to +0.0000, -0.0015 in. on finish dimension

Boring the housing takes care . . .
because enough heat is generated to cause difficulty on critical dimensions. On some operations, holding clamps are loosened between rough and finish cuts to allow part to "relax." On others, the piece is removed from machine after roughing so it can cool off before finish cuts

gear seat—held to +0.001, -0.000 in. on diameters from 8 to 19 in. But the closest tolerances are found on the seat for the main bearing; one example is +0.0005, -0.0000 in. on a 3.3465-in. dia.

Another part that requires careful work is the cage body. The machining of this part calls for an interrupted cut on the portion that fits into the other half of the cage assembly. Diameters up to about 19 in. are all held to +0.0000, -0.0015 in.

In spite of the close work, all this machining is performed under normal operating conditions for cast iron: carbide cutting tools; no coolant; speeds of 225 to 250 sfpm; and feeds of 0.010 to 0.015 ipr for roughing, 0.010 ipr for finishing.

GEAR CUTTING

In the gear-machining area, where all the pinions, planet gears, and internal ring gears are cut, the specifications are no less exacting. An average-size planet gear has about a 6-in. pitch diameter, a 2-in. face width, and a 23° helix angle. The tolerances on a gear of this size are 0.0005 in. for the involute profile, 0.0015 in. for the PD runout, 0.0006 in. lead error, and 0.00035 in. on the tooth-to-tooth spacing.

In order to meet these standards, the equipment must be maintained in top-notch condition. A hobbing machine, for instance, must be good and tight, so there is no play that would jeopardize its running true and repeating the same dimensions consistently. Wobble is a constant enemy and must be guarded against, not only in the machines, but also in the hobs and the gear blanks as well.

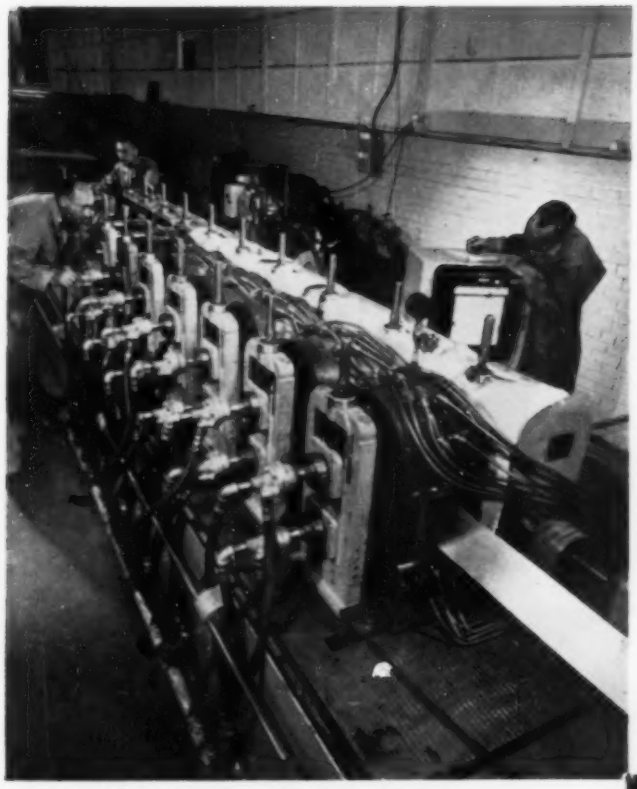
As might be expected, great care is taken in setting up for each production run. The setup is not okayed until the first piece produced has passed a thorough check in a gear lab equipped with the latest inspection equipment. Once the first piece is approved, quality is maintained during the remainder of the run by a statistical sampling procedure, the normal sample being 20%.

After hobbing, almost all external gears go through a gear-shaving operation. The main purpose of it is not to make corrections, but to improve the surface finish so the gears will run more quietly when they are installed in a reduction unit. Some imperfections *can* be remedied by the shaving machines, but only very small ones, because the operation removes very little material.

Internal ring gears are cut with gear shapers, of course, not hobbers, but many of the principles are the same. The same degree of quality is maintained, and many of the problems are similar, though the details of solving them are somewhat different from one type of machine to the other.

It should be pointed out that there are no extra-special gadgets or gimmicks involved in any of the operations at this plant. There are fixtures where necessary, of course, but the tooling would be called "adequate" rather than "elaborate." If there is any trick in the way the specifications are met, it seems to be the "trick" of good, careful workmanship.

And there's one other factor. Most of the employees have been working in the plant for a number of years, so they can boast a knowledge of the peculiarities of the machines they work on, and they have the touch that can give a machine exactly the adjustment it needs. On top of that, there may also be a psychological element in the fact that nobody is scared of close work—they do it every day.



Standard Yoder roll-forming machine . . .
has special circular 18-burner furnaces that burn propane (or natural gas) mixed with air automatically. Fuel feed is controlled by infrared sensing device. Units take about an hour to reach proper operating temperature

Titanium is roll-formed hot...

. . . in standard equipment modified to operate at elevated temperatures that prevent cracking. Here's how Boeing Airplane Co, Seattle, solved the problem of making complex strip-titanium shapes for the B-52, the 707 transport, and other high-speed jet aircraft

GEORGE H DE GROAT, associate editor

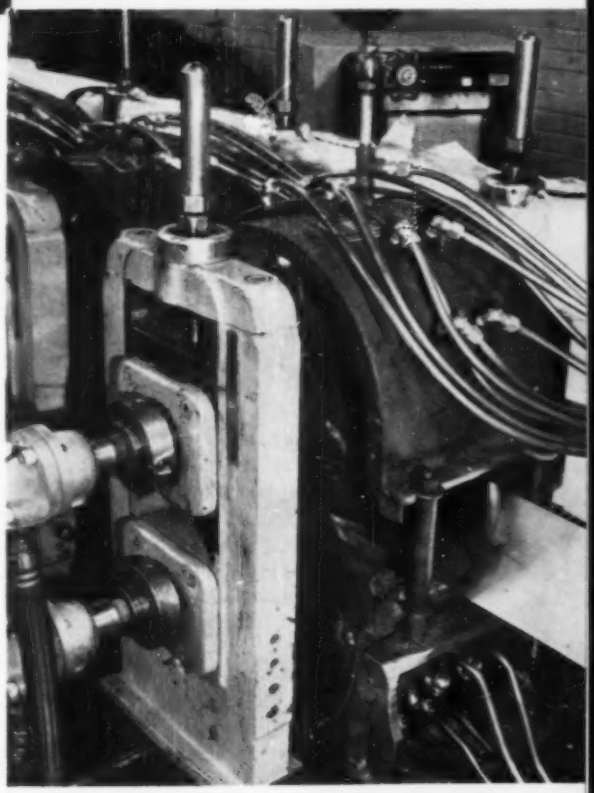
Aircraft builders have made good use of standard roll-forming equipment for many years, producing stringers, circumferential stiffeners, and other complex parts from strip and coil stock. But high-speed aircraft now require more and more parts made of titanium, which must be formed at elevated temperatures. In many operations the stock itself may be heated, or the dies can be heated, but roll-forming equipment brings in special problems.

The aim is to bring the temperature of the stock up to 1000-1500 F. In a conventional Yoder machine, the stock is fed through a series of rolls, each of which has a slightly different contour that shapes the stock gradually to the desired shape.

But hot stock, in preliminary investigations, cooled off too rapidly as it hit the cold rolls. Higher temperatures were impractical because the stock would contaminate too easily.

On the basis of preliminary tests, the Yoder machine was modified by adding enclosed heaters that warmed the rolls themselves. Although it was thought that 1500 F would be necessary, a temperature of 1000 F worked out satisfactorily. The heavy mass in each roller, which helped cool off the strip in the original setup, keeps the temperature even.

Most tests have been run on titanium strips 8 ft long, although 32-ft strips have been butt-welded together and rolled successfully.



Bearings are cooled by water . . .
that circulates through hollow shafts. Unit operates at 1000 F, at which rolls glow dull red, but bearings run cool. Tests results at rolling speed of 1½ fpm indicate a production speed of 12 to 15 times as fast will be possible

Tracers trade tinfoil for graphite

Now non-conductive molds and dies can be duplicated from master patterns made electrically conductive by a thin coating of colloidal graphite

A specially designed electrical system called the "Mealey Contour Following Signal Device" controls the cutting feed to produce dies and molds. By milling from an electrically conductive master pattern, with a tracer stylus to directly determine the cutting tool position, intricate contours are readily followed.

Developed by Mealey Grease and Oil Company, Cleveland, Ohio, the master and stylus are part of an open electrical circuit. The moment the stylus contacts the master, the circuit closes and produces a signal. For manual operation, this signal can warn the machinist to stop the cutting feed. The signal can also be used for direct automatic control of feed.

Tinfoil was one of the original conductive materials applied to the master pattern. However, it is not the easiest material to manipulate. Tinfoil is readily torn and wrinkled. By the time an intricate embossed surface is smoothly and uniformly covered with foil, using adhesive, the cost can be high. Also, foil thickness must be allowed for, and the spark or arc at the stylus, though small, frequently burns holes in the foil.

Instead of applying tinfoil to the master, Mealey coats it with a liquid containing "dag" No. 154, a dispersion of colloidal graphite in isopropanol, made by Acheson Colloids Co, Port Huron, Michigan.

Colloidal graphite films have high electrical conductivity. They provide extremely thin and tenacious coatings which will not affect close tolerances in milling, and will not break or rub off. The coating is quickly brushed on. Its conductivity becomes a permanent characteristic of the model surface.

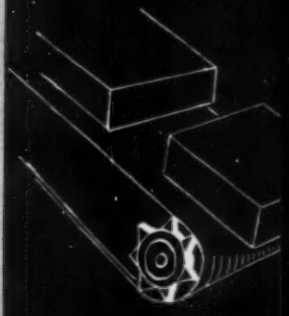
Because the signal generator is an electronic tube, providing grid-circuit triggering, the actuating current flowing through the flexible leads, the machine, and the surface of the model is so weak there is no danger of shock or fire. An accidental "short" in the control circuit simply causes a continuous signal—asking to be corrected.

The Mealey method is extremely versatile. Setups have been developed using one, two or three circuits, the latter to control the three dimensions of a rectangular cavity—length, width and depth. While a single circuit can handle many contours and curves in a surface, sharp changes in angle or right angles are usually best accomplished with a second (or third) circuit.

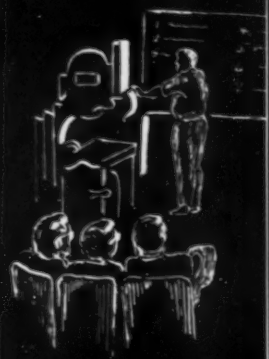
Operator feeds cutter . . .
into work until he hears contact warning from loudspeaker. (Signal can be fed to servomechanism for automatic control.) Tone control enables operator to adjust pitch of warning signal to most effectively contrast with other shop noises

Two signal devices . . .
control milling in two directions. Outfit nearest to operator controls vertical feed; other unit governs width of shoulder. Signal tone is turned to provide a distinct sound for each circuit—to ease identification during operation

Cost reduction program saves $9,300,000 in 2¾ years



There is no better time than now for top management to take bold measures for setting up a cost-reduction program that will save thousands, possibly millions of dollars a year. This deliberate, planned action seeks maximum use of materials, facilities, skills, time, and energy, and the elimination of waste, misuse, and hazards. Such a program separates routine, day-to-day measures from deliberate cost-reduction efforts. Most supervisory heads will claim that a cost-reduction program is ridiculous, because they always earnestly work to save money for the company, every day of the week. But can they show, first, a deliberate cost-reduction plan, and secondly the actual amount of money saved by this plan? If they can't, then it is time for top management to take a hard look at how Republic set up a practical two-man cost-reduction program that is applicable to all kinds of industrial plants



American Machinist

SPECIAL REPORT NO. 456

February 24, 1958

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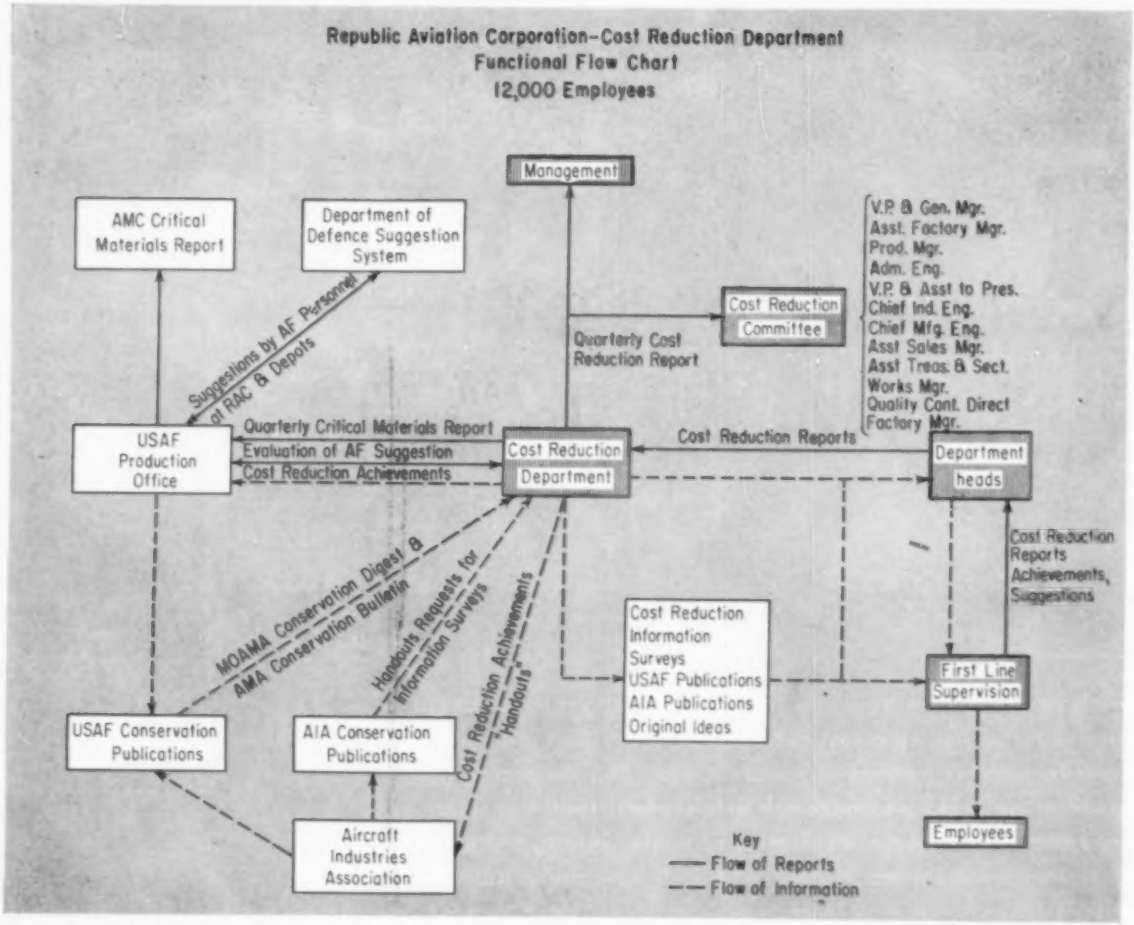


Manufacturing plants . . . in general could set up an organizational flow chart similar to those divisions shown in darkened areas. Plants engaged in Air Force contracts could follow divisions shown in over-all pattern. Although Republic has 12,000 employees, this flow chart is still applicable to companies having 50 or less employees. Republic's cost-reduction department is composed of two men, one of whom spends 50% of his time on safety problems. Monthly and quarterly achievement reports are forwarded to the AF to keep them informed on company activities. The AF in turn publishes these achievements in their own digest. The AIA exchanges information and ideas that other companies have found successful in reducing costs

Today, department heads at Republic readily accept the functions of a cost-reduction program because now they realize that this program is a part of their departmental responsibilities. Their acceptance is as it should be, because department heads and supervisory members are responsible for, and should be actively engaged in cost reduction.

However, it is not our intention to imply that the initial institution of the cost-reduction program was greeted with open arms by supervisory personnel. On the contrary, many departmental heads rebuffed the idea on the grounds that it presented an additional chore for an already overburdened supervisor. Many arguments were presented in an attempt to circumvent the issue. One of the biggest arguments was that a supervisor makes it his personal business to save money for the company every day of the week. However, when the department heads were requested to make a report of these purported savings, in terms of dollar and cents, the response was apathetic. At this point it became quite evident to all the participants that the only logical way to achieve results from cost reduction is to organize a program that holds department heads responsible for its success.

It's noteworthy to point out at this time that after the program was in full swing, two major results were discovered. Both results came as a complete surprise to all department heads. First they discovered that now through the cost-reduction program they achieved closer communications with their departments, and secondly they learned that many departmental activities, heretofore unbeknown to them, were being carried out in their own departments every day of the week.

To avoid difficulty in obtaining cost-reduction ideas and methods from departments, Republic's first step was to acquaint all personnel with the activities of the program. This initial endeavor was undertaken in order that a cooperative effort might be established and coordinated to further build and prove the company's prestige as a low-cost producer

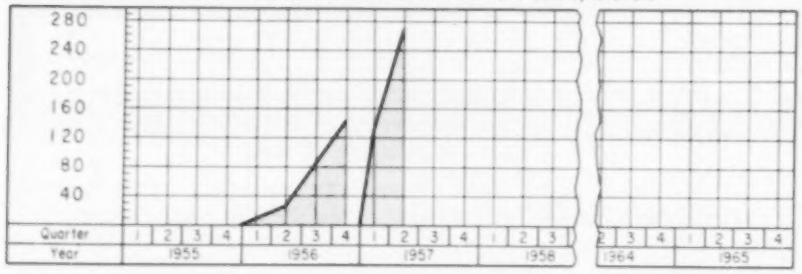
COST REDUCTION ACHIEVEMENT

Management Control Report

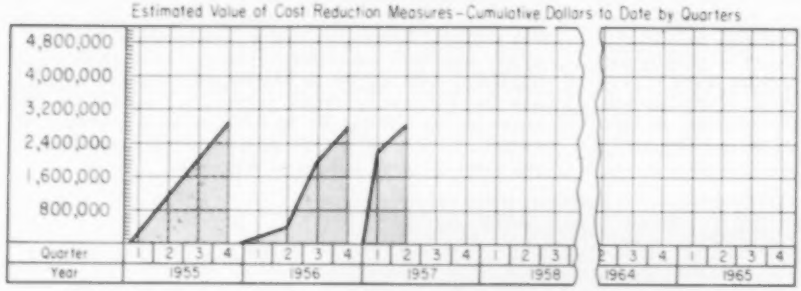
Based on quarterly reports by departments

DEPT NO.	DEPARTMENT NAME	SUPERVISOR	CUMULATIVE PREVIOUS YEAR		FIRST PERIOD JAN–MAR		SECOND PERIOD APR–JUN		THIRD PERIOD JUL–AUG		FOURTH PERIOD OCT–DEC		CUMULATIVE TO DATE	
			NUMBER OF REPORTS	DOLLAR SAVING	NUMBER OF REPORTS	DOLLAR SAVING	NUMBER OF REPORTS	DOLLAR SAVING	NUMBER OF REPORTS	DOLLAR SAVING	NUMBER OF REPORTS	DOLLAR SAVING	NUMBER OF REPORTS	DOLLAR SAVING
			3	75384	1	20625	4	1341					5	21966
			1	24			1	45057					1	45057

Number of Cost Reduction Measures–Cumulative to Date by Quarters

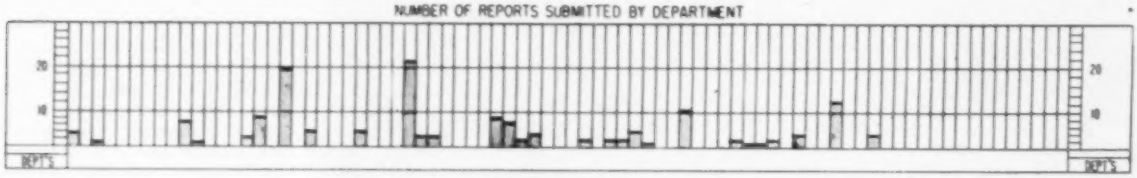


Estimated Value of Cost Reduction Measures–Cumulative Dollars to Date by Quarters

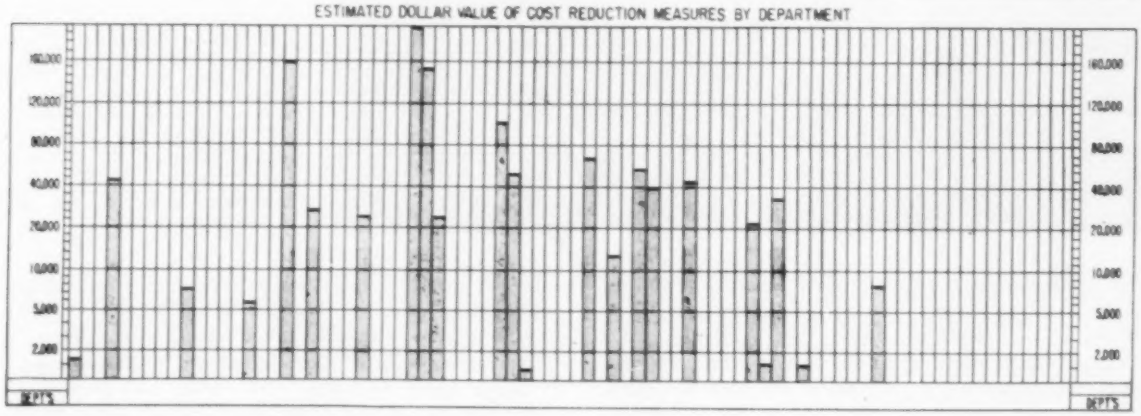


Quarterly reports . . . are sent to top management in the form of the chart and graphs shown here. These reports, summarize the number of ideas submitted and the total yearly savings. All departments are listed regardless of whether or not reports were submitted. The basic objective of these reports is to stimulate creative thinking throughout the company toward cost reduction. It is not the committee's intention to establish a record of money saved during the year, but to further the employees' active participation and interest in cost reduction. With the wholehearted cooperation of employees in this program savings will result from finding better ways to build the company's products more economically. A summary of cost reduction achievements during 1955 showed a savings of 2.8 million dollars, in 1956, 2.6 million dollars, and for the first nine months of 1957, 3.9 million dollars

NUMBER OF REPORTS SUBMITTED BY DEPARTMENT



ESTIMATED DOLLAR VALUE OF COST REDUCTION MEASURES BY DEPARTMENT



of quality products. Duties of the cost reduction committee are focused in three areas: Republic's operating departments, the customer (in this case the Air Force), and the industry as a whole. Primary function is to stimulate positive thinking in the formulation of cost-reduction ideas, and to encourage adoption of cost-reduction measures in all departments. Each department is supplied with information and suggestions for setting up an effective cost-reduction program suited to the requirements of each individual department.

Ground rules were established for the guidance of department heads when reporting cost reduction activities to the committee. These rules point out

TABLE "A"

GROUP 1 PRODUCTION SHOPS	GROUP 2 OVERHEAD & INDIRECT SERVICE	GROUP 3 INDIRECT PRODUCTION	GROUP 4 TECHNICAL DEPARTMENTS

TABLE "B"

NUMBER OF DEPARTMENTS REPORTING COST REDUCTION ACHIEVEMENTS	Percentage of Group Reporting				
	All Depts.	Group 1	Group 2	Group 3	Group 4

TABLE "C"

NUMBER OF COST REDUCTION ACHIEVEMENTS REPORTED	All Depts.	Group 1	Group 2	Group 3	Group 4

TABLE "D"

KIND OF COST REDUCTION	% OF TOTAL ACHIEVEMENTS SUBMITTED BY EACH GROUP			
	GROUP 1	GROUP 2	GROUP 3	GROUP 4

Cost reduction is measured . . .
by the number of departments reporting achievements and the number of these achievements reported. In order to analyze achievements, reporting departments are divided into four groups as shown in table *A*. These divisions were made so that a comparison could be drawn between departments of similar function and capacity to reduce costs. This table is also used to indicate which departments reported in each of the quarterly periods. Table *B* contains the percentage rating over the past two years as well as the percent of change in reporting during quarterly periods in the current year. Table *C* contains percent of change in achievements between last and present quarters as well as percent of change between average quarter of past year and present quarter. Table *D* contains two additional sections. One section is devoted to fixing responsibility, i e, whether the achievements were considered part of the department's normal function or responsibility, or whether they were considered outside the department's normal function or responsibility. The second section indicates the kind of savings, i e, whether the savings related to paper work, direct material, manhours, material handling, space, utilities, or scrap cost

An organized attack . . . on cost problems by the supervisor of the spares shipping department resulted in an improved process flow, elimination of losses and delays in packaging, and considerably reduced material costs. View above shows the former packaging, processing and binning areas that are indicative of the inefficiency of this shipping operation; a status that had existed during many years of high-volume shipping. Note the over-all congestion, large amount of in-process storage, absence of power-assisted material handling, and expensive packing materials. All of these factors attributed to the waste, inefficiency, and high cost of this shipping operation

that the program is a deliberately planned action to achieve cost reduction through maximum utilization of materials, facilities, skills, time, energy, and through elimination of waste, misuse and hazards. That cost reduction is the dollar amount resulting from costs reduced during the first year of adoption of a new method. All cost-reduction achievements should either reduce costs by a measurable, tangible dollar or produce an immeasurable, intangible benefit. The program is not intended to limit the scope of what is and is not reportable, because cost reduction itself is not limited in scope. However, for practical reporting it is necessary to separate the normal, routine, day-to-day measures from those deliberate, planned cost-reduction efforts. When reporting, the categories below should be considered.

1. Technological Cost-Reduction Achievement. This category includes cost reductions resulting from the application of technological advances, such as material improvements or material savings, process improvements, machine and equipment utilization, etc. These advances are acceptable even though they occur as the result of the department's regular activities. Aircraft design changes cannot be included. However, unusual or outstanding design changes may be accepted.

COST REDUCTION ACHIEVEMENT REPORT

SUBMITTED BY:_____ DEPARTMENT:_____ DATE:_____

1. BRIEF DESCRIPTION OF COST REDUCTION ACHIEVEMENT:_____

2. OLD METHOD (If necessary, attach additional descriptive sheet, drawings, etc.)_____

ESTIMATED YEARLY COST_____ $_____

3. NEW METHOD (If necessary, attach additional descriptive sheet, drawings, etc.)_____

ESTIMATED YEARLY COST_____ $_____

4. ESTIMATED YEARLY SAVINGS_____

(Old Method minus New Method minus Cost of Installation) $_____

5. INTANGIBLE BENEFITS, IF ANY

6. DATE INSTALLED_____

7. OTHER REPUBLIC DEPARTMENTS, VENDORS OR AIR FORCE THAT MAY BENEFIT FROM THIS IDEA_____

Cost reduction report form . . . shown above indicates the only kind of information that is required by the committee. As can be expected, some departments do a more outstanding job of reporting achievements than do other departments. The reason that some departments do better than others is that these departments have taken it upon themselves to develop an organized system of reporting. This system simply entails the appointment of a supervisory member within the department who is responsible for collecting information for the quarterly report and who lobbies for cost reduction in his department. Such an arrangement contributes more direction to the program and to a greater creation of cost-reduction consciousness. For example, the manufacturing engineering department submitted 42 reports during the first half of 1957 comprising an estimated savings of $790,300

New floor layout . . . of the shipping department includes a powered automatic conveyor belt that is fed from cycle loading packaging stations. This new system has resulted in a 23% increase in packaging capacity, an actual 22% reduction in manpower, and a 60% reduction in handling

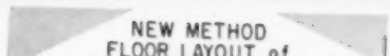
2. Improved Department Management. This includes those items not covered in category 1 which fall under the department head's normal responsibility and pertain to efficient departmental operations such as reduction or consolidation of reports, systems improvements, reduction of activities without loss of efficiencies, and overall reduction in paper work. Usually, tangible savings can be realized in this area only when the efficiency results in reduction of personnel.

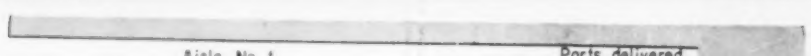
3. Cost Reductions Affecting Departments Outside a Department Head's Normal Function. Cost reductions resulting from inter-departmental coordination, technological advances or improved operating efficiencies that are outside the normal functions of the department head would be included here.

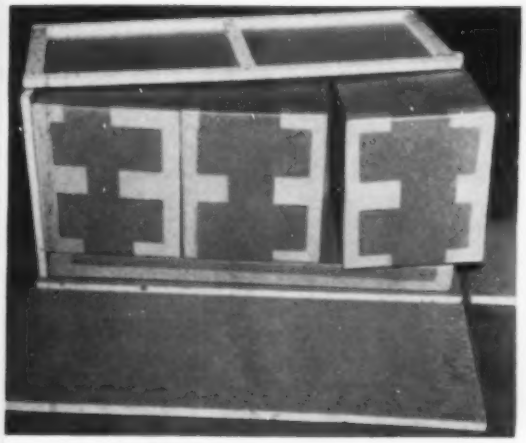
Obviously, the above groupings will not cover all situations. Therefore, if any doubt exists concerning the report of an achievement it is discussed with the cost-reduction department.

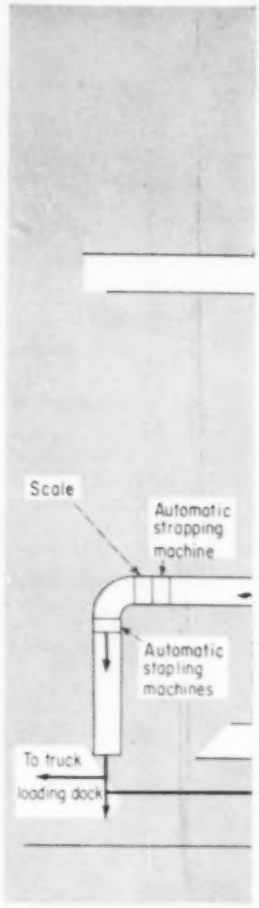
Each department head passes on to all levels of supervision his own understanding of the necessity for cost reduction and how it can be accomplished. In this way the basic objective of making every employee cost conscious is more readily achieved.

Each department is required to submit quarterly









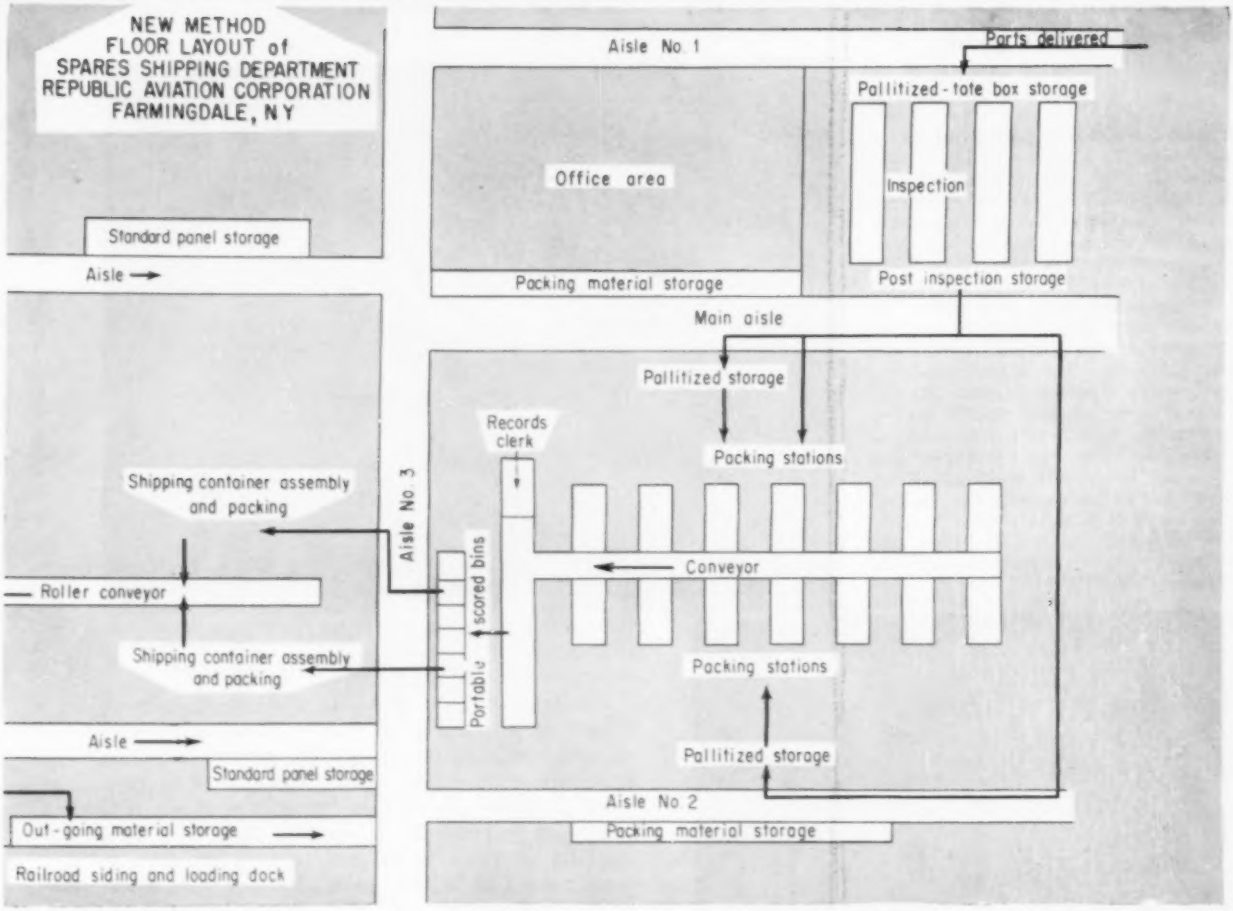
Standardized panels . . .
are designed as a completely reusable shipping container. Container above (right) is being assembled with fasteners known as KLIMPS (patented, North American Aviation). Fastener not only reduces nailing time by 50% but also permits the container to be opened without damage in 1/5 time a nailed box requires. The receiver therefore is supplied with a completely reusable shipping box and fasteners. Maximum economic advantage of this new operation will not be fully realized until the reusable shipping container is in general use at customer facilities

Packaged material . . .
moves down conveyor and is segregated according to destination in portable bins. Each bin is graduated in two-inch increments for its length, height, and width. When customer's order is stacked inside a bin, it is then transported to the box-maker who can immediately choose the proper size shipping container. He determines standard box size from a chart which codes the graduated lines visible around stacked boxes. Standard shipping container (described later) is assembled in seven minutes and filled with packages from bin. Container is then placed on a roller conveyor for labeling, inspection, closing and weighing

achievement reports to the committee. These reports include a detailed description of a cost-reduction proposal, giving the old and new method. A detailed breakdown is given of estimated or actual monetary savings for the first year affected, including man hours, material, equipment savings, and cost of placing the new method into effect. Date the new method was adopted and extent of use are listed, as well as all intangible benefits in addition to, or in lieu of, monetary savings.

Inherent in any such program is the human element. Inasmuch as this is basic to a cost reduction

Cost reduction program . . .



A savings of $40,000 a year . . . is realized as a result of the standardization of shipping containers and the new floor layout of spares shipping department shown above. Here's how parts are now routed through shipping department. Parts are loaded on a cycle basis moving from left to right across the inspection tables; then stored in tote boxes. A fork truck delivers tote boxes to packing station. Here they are packaged and placed on conveyor, collected, and placed in portable, graduated bins by destination. Bins are delivered to crate maker where correct size shipping container is chosen according to visible graduations on bin. Shipping crate is delivered and assembled in 15 min, placed on roller conveyor, closed, labeled, weighed, and stored for shipment

program, a considerable amount of time is required to educate the employee. In the education program considerable emphasis should be placed upon the WHY of material conservation, and the tactics of selling the employee as contrasted with telling him. Department heads are in agreement that only the "sold" employee will give wholehearted support.

To obtain immediate and long-range results each department head uses his own method of obtaining cost-reduction reports. Some assign a member of his supervisory staff the responsibility of collecting information, but do not establish a goal. Therefore, it must be up to the supervisor to tailor the cost-reduction responsibility to his own department's personality and functions. Other department heads instruct their supervisory staff to submit at least one cost-reduction report per week. By the same token, supervisors guarantee their personnel that they can feel free to discuss any cost-saving activity or idea with any member of the committee without becoming personally involved. As a result of this guarantee some of the largest cost saving ideas and methods have been uncovered. In a strict sense these activities revolve around the revelation of skeletons in closets. Additional incentive to supervision's participation in the cost-reduction program is provided by entering a copy of the achievement report into the personnel file of the person responsible for the cost reduction. If employees other than supervision substantially contribute to a cost-reduction achievement, they too have a report entered on their personnel record.

Routing Reports

1. Reports are submitted through the department head or superintendent.
2. Reports are submitted on achievement-report form available from stationery stores.
3. Reports are submitted in duplicate. One copy for the personnel record.
4. In all cases it is required that the achievement submitted in the report actually has taken place during the current report period.

Cost-Reduction Achievements

BORROWED MACHINE TIME

To cut up test samples of raw materials, receiving inspection had been in the practice of borrowing

Standardized box panel system . . . consists of 22 different size panels from which 41 of the more frequently required box sizes can be made. The standard panels are constructed on a production basis of 1x2x⅞-in. lumber, and V3C waterproof, 400-lb-test fiber board. They resulted in a 20% reduction in shipping weight over the former custom-made, all-wooden box. This standardization program has not only resulted in considerable material savings but also enhanced the process flow of shipping as well as a subsequent saving in labor. During the former method there was a 24-hr delay between the time that packages were measured for shipping containers and delivery of this container. It then required between ½ to 1 hr to prepare container for shipment. Under the new standard container system this whole procedure takes between 5 to 15 min

Five standard sizes . . . of triwall corrugated cardboard containers represent another new shipping system for domestic shipments. These containers are received flat, precut, scored with 2-in. graduations, and are easily stored in quantity. Boxes are formed by folding along graduated lines and tack-fastening with staples. When boxes are filled, they are secured by an automatic steel-band strapping machine. Exclusive use of steel bands for fastening results in a reusable, easy to open, shipping container. These cardboard boxes have been responsible for a reduction in labor formerly required for nailing and stapling and a weight savings averaging 14,400 lb per month. Arrangements were made with a local paper box manufacturer to obtain non-standard size boxes in small orders within 24 hr. These boxes (shown above) are handled in same manner as the standard cardboard boxes and have eliminated need for constructing special wooden boxes. Box above, nesting a door assembly weighing 43 lb, represents a savings in weight of 49%, 14% reduction in cubic volume, and a 60% reduction in packaging cost over the formerly used wooden box. Both panel and cardboard boxes have been tested and accepted under U S Government Military Specifications

time on any one of three power hacksaws located in other departments. This procedure usually involved considerable time delays because these hacksaws were not always available to inspection personnel. Also, transportation of material to and from these machines added to the cost of the operation. To relieve this costly situation, the quality control department acquired a 20-in. abrasive cut-off machine for use in the receiving inspection area. Resulting savings are estimated at over $32,000 in manpower during the first year of use.

It is interesting to note that this cut-off machine is part of a planned pattern to obtain maximum utilization of abrasive wheels. The wheel is supplied originally to the experimental shop as a 26-in. disc. When it is worn down to a diameter of 20 in., it is passed on to receiving inspection. Here it is used until its diameter is reduced to 15½ in., then is again passed on to raw-material stores, who use it to its ultimate end.

PART-NUMBER INSERTS

A recent development in the manufacture of part-number inserts for Hydro Press form blocks has resulted in considerable savings in material and man hours. Formerly cold-rolled-steel inserts (¼x¼x2 in.) were purchased. Part number and characteristics of the tool were engraved on inserts. Inserts were then case-hardened and cemented into a cavity milled into surface of form block. Transfer of the part number to the detail part was made by impression during the Hydroforming operation.

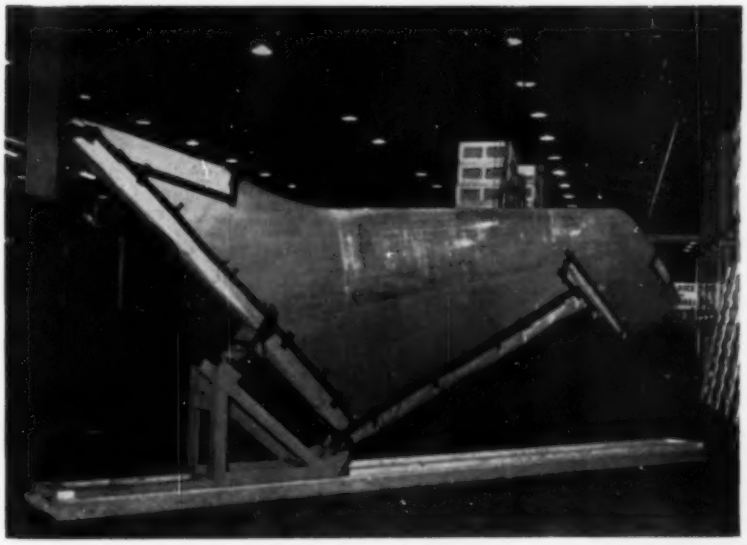
Under the new method, insert is stamped from stainless steel 0.012 in. thick. Part number is then stamped on insert by means of an Addressograph Graphotype machine. Insert is then cemented into a shallow slot milled in restriction plate of form block. Savings in one year amounted to $20,000.

CONTROL OF BANDSAW BLADES

A study of Republic's bandsaw-blade requirements revealed that these blades were being used at the rate of 60,000 feet per month. In order to reduce this excessive rate, the following rigid controls were immediately placed on their issuance:

1. Blade stock was issued only in lengths to fit bandsaws. Past practice of issuing 100-foot lengths was eliminated.
2. Issuing of blades was now done on a one-for-one exchange basis.

An investigation was then launched to determine



Large aircraft assemblies . . . have always been a shipping problem to both the Air Force and Industry. These items are usually extremely expensive to pack. Weight and volume of these packages restrict them to freight or truck shipment. Because of their large area on odd shapes they are also difficult to warehouse. Photo below illustrates kind of container that was built to ship Republic's F-105 vertical fin assembly. A new shipping container design incorporated a steel frame built on skids (photo left). The wing-hinge points are picked up by the steel frame, resulting in a flexible, lightweight shipping assembly that can be shipped air freight and easily stored. This idea resulted in a packaging cost savings of 48% and a 53% reduction in shipping weight. Actual floor space for warehousing this part would be 28.3 square feet; that is a reduction of 100 square feet from the former box design

how to reduce bandsaw blade usage still further. A test of bandsaw blades manufactured by various companies was performed. Different materials were cut to determine which blades were superior. Also, an inspection of each bandsaw machine was performed to determine wear, adjustment, and usage. A tally of issued blades was kept to gage and detect significant changes in blade requirements.

All this information was compiled and interpreted. Corrective measures were taken to improve faulty equipment. Maintenance and adjustment of bandsaws are of major importance. The most important factor in achieving proper economy was found to be the education and training of personnel. Employees were given on-the-job training in the utilization of bandsaws. This training was accomplished with the cooperation of the DoALL Company.

Additional controls were placed on bandsaw-blade issuance after the training program was accomplished. Tool crib attendants were instructed to tag each used blade with employee's name as it was turned in, thus providing a means of spot checking to control and enforce their previous training.

Through this program Republic has cut in half the use of bandsaw blades, and savings after a six month's period amounted to $24,000.

LONG DISTANCE TELEPHONE CALLS

All new employees are told during indoctrination proceedings that personal outside telephone calls are not allowed on company telephones. In order to control this ruling, telephone operators request the caller's name and department before placing an outside call. The operator may also question the caller as to the nature of his call. Numerous public telephone booths have been placed throughout the plant for personal use.

Some departments, such as Purchasing, have a large volume of long-distance calls, and they have initiated a control of their own. Individual slips explaining calls and their duration are made up by the caller for each long-distance call made. Also, IBM run-offs of long-distance calls coded to the caller, show the cost of calls. These two documents are evaluated by the supervisor and discussed with the individual urging him to cut down the number of calls and their duration by a more efficient arrangement of work. It is estimated that this procedure has reduced the telephone bill in this department considerably.

Long-distance telephone calls are controlled as follows:

AUTHORIZED EMPLOYEES

1. Only those employees who are required to make official long-distance calls on company business are authorized by department heads to place such calls.
2. In placing calls, each authorized employee will:
   a. Place the call through the company switchboard, and in no other manner.
   b. Give the operator his name and department No.
   c. Report the call and "time" on control form shown on pg 122, sign, and forward to his supervisor.

   NOTE: Transfer of calls to other departments is prohibited.

LONG DISTANCE TELEPHONE REPORT

CALL MADE BY: BADGE & DEPT NO. DATE

PARTY CALLED: CITY:

PURPOSE OF CALL:

RESULT OF CALL:

ELAPSED TIME
START FINISH TOTAL MINUTES

YOUR SUPERVISOR (DEPT-HEAD) APPROVED:

APPROVING SUPERVISOR PLEASE FORWARD TO OFFICE SERVICE MANAGER

	YES	NO
WAS THIS CALL TO *GIVE* ONE WAY INFORMATION:	☐	☐
WAS CALL MADE TO *SECURE* INFORMATION:	☐	☐
IS A WRITTEN RECORD OF TRANSACTION ADVISABLE:	☐	☐
WOULD *TELEGRAPH* OR *AIR-MAIL* GET SAME RESULT:	☐	☐
WAS THIS CALL NECESSARY (SUPERVISOR CHECK):	☐	☐

Note: Reverse side of this report indicates comparative rates for L.D. telephone calls, vs. telegram, vs. night letter to principal cities in U.S.

SUPERVISOR

3. Review reports, certify necessity, and forward to Office Service Department.

Office Service

SWITCHBOARD

4. Prepare "Ticket" for each long-distance call made, time and cost.
5. Forward to tabulating.

TABULATING

6. Furnish office service with cumulative record of long distance charges, by department.

OFFICE MANAGER

7. Compare employee reports of calls made with switchboard "Tickets" to insure proper "Time" reports.
8. Notify responsible supervision of discrepancies.
9. Prepare monthly reports of telephone cost trends to department heads.

With the inauguration of this program in 1956 there was a reduction of 24.8% in LD telephone calls for that year, amounting to a cost-reduction saving of $36,000.

Telegraph

In one of the outside engineering offices, communications with the local telegraph office was via telephone. As a result, telephone lines in this office were continually being tied up. Recently, a Western Union device called a "Desk Fax" was installed at no cost to Republic. This device provides a direct line of communication between Republic and Western Union and is capable of sending and receiving typewritten messages. The company is billed by Western Union on a message unit rate but there is no monthly rental charge for the device.

Eliminating Excessive Paper Work

Here are two practical methods that have proved successful in the elimination of excessive paper work and forms.

1. During a one-month period one department stopped forwarding all company forms to personnel listed on the routing sheet. Those people who have a purposeful need for certain forms soon demand their copies, and to these people copies are sent. It is interesting to note that in the final tally some forms will not be requested by anyone. Savings in this department for 1956 amounted to $24,200 from a reduction in paper work and non-essential reports.
2. A second method has each department head post all the forms received in his department on a bulletin board. Then one by one he calls in his section heads and asks their opinion as to which forms can be eliminated and what forms can be consolidated. This method has resulted in a 25% reduction of non-essential forms, or approximately 7000 to 7500 sheets per month.

WHAT LIES AHEAD

The Republic cost-reduction program is still in its infancy. This program will continue to grow by concentrating on selling cost reduction until it becomes an integral part of the supervisor's thinking. It should be kept in mind that the existence of such a program will not in itself reduce costs. The program must be constantly renewed. New ideas and techniques must be tried. Systems must be periodically reviewed with an eye towards increased efficiency.

A Cost-Reduction Bulletin is now being considered. This publication will be used not only to pass on cost-reduction ideas to supervision, but also to promote cost consciousness. The immediate aim of this program is to make cost reduction more dynamic. Supervision instead of looking for items to report will look for ways to cut costs.

REPRINTS ARE AVAILABLE of this and all other* American Machinist *special reports

Send to Reader Service Dept, American Machinist, 330 W 42nd St, New York 36, NY, for list of reprints available and prices. Or enclose, with your request for a specific reprint, 35c if it is 16 pages, 30c if 12 pages, 25c if 8 pages. Prices are reduced for quantities over 100 copies.

Round Table...

Slush Fund

"I see your boys are passing the hat again, Al. Who is it this time?"

"It's Marshall, Ed. He just got over his operation, then he broke his leg. His insurance won't quite cover his doctor bills, and he's been out of work a long time. He really needs help."

"I suppose so, but I sure get mad at these collections that keep coming along. There ought to be a company rule about them. I tried to cut it out in my department, but I found out they were collecting behind my back, so I gave up."

"I know they're a lot of bother, Ed; but one of my boys came up with a pretty good idea. He suggested we take up a regular collection from everyone in the department every payday. That way we'll develop a kitty that will handle anything that comes along. It won't be near as much bother."

"It sounds OK, but what if you develop a surplus or don't have enough in the kitty? Suppose two guys need help right away?"

"Well, we could start it off big by asking a dollar apiece, then cut it down to a quarter a week after the first week. That ought to be enough for almost anything."

"This sounds just like insurance, Al. The trouble is, it's enforced insurance. You can't do it unless everyone in your department cooperates. And when you hire new men, they have to join in. Why, even the company can't get away with a thing like that. Our group insurance has to be voluntary, you know."

"Sure, Ed; but this kitty idea is just a small deal, and all of the men we asked so far are in favor of it. If we get a holdout, we can just ignore him."

"And what are you going to do if your holdout needs help; ignore him some more?"

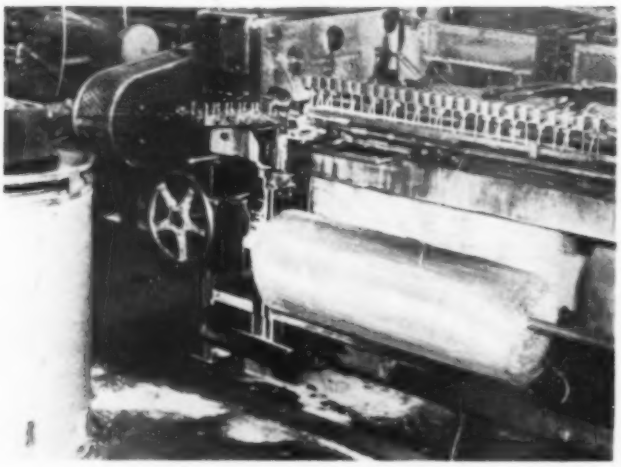
"Well, we'll cross that bridge when we come to it, Ed. I think if everyone else agrees, one or two stubborn individuals will go along with the idea, too."

"Just don't let Personnel hear about it, Al. Under company rules you probably have no right to do anything like this."

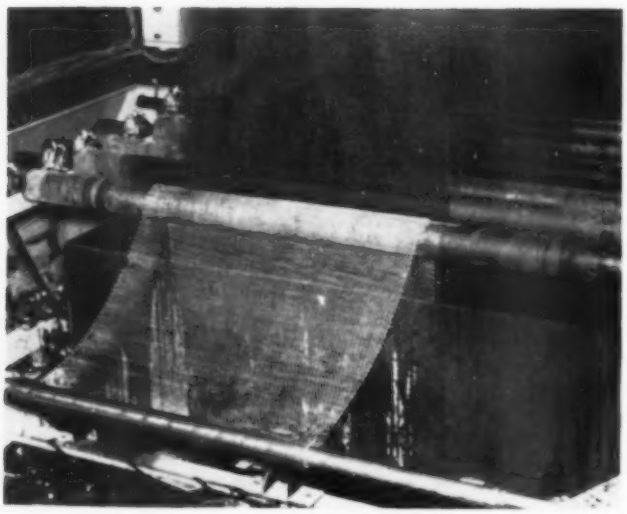
• • •

DO cooperative slush funds solve the collection problem? Or is it possible to eliminate all kinds of collections entirely? Your opinions may help others. Discussions of earlier topics start on page 185.

Special machines . . .



Specialty steel wire is fed from drums . . . into machine which weaves it into fireplace screen. Widths range from 20 to 48 in., and rolls are 100 ft long. Next, another special machine trims fabric to width and clinches the ends of interlocked spirals



Fabric is dip-painted . . . after being stress relieved at 1100 F so the screens will not warp or sag in service. Primer is zinc chromate; finish coat is black baking enamel. After each coat of paint, the fabric travels past infra-red baking units

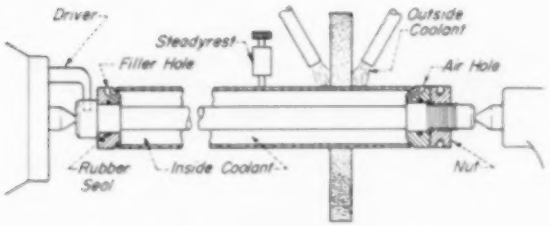
weave, trim, treat, and paint . . . fireplace screen fabric

For years the wire fabric for fireplace safety screens was woven on standard wire-weaving machines which produced fabric of mattress-type weave or intermeshed circular weave. This fabric was difficult to cut and fit in custom installations, and it was not particularly attractive or durable.

To remedy this situation, Bennet-Ireland, Inc of Norwich, New York, manufacturers of decorative fireplace furnishings, developed specifications for the ideal fabric. It would be safe and attractive, durable but easy to work, and it would allow a full view of the fire. Then they designed and built their own equipment for manufacturing the new product.

Completely automatic machines weave, trim, and clinch the fabric. Other specially designed equipment, also automatic, handles heat treating, priming, enameling, and baking. Only the final assembly into fireplace screen units is done by hand.

Practical Ideas...



Internal Coolant Prevents Tube-Grinding Distortion

We recently had to grind the OD of several hundred pieces of lightwall tubing. They were 2½ in. in diameter with a 0.093-in. wall thickness and 48-in. long. This dimensional ratio will spell difficulty in any man's shop, even if he is well equipped.

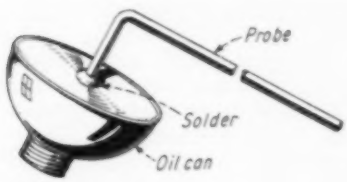
Using an auto-crankshaft grinder equipped with the proper grinding wheel, we flooded the work with coolant but were still troubled by distortion. After experimenting with several methods, we solved our problem with the arbor arrangement shown.

It incorporates what might be described as a long bolt with a tapered seal ring at each end and a nut in the tailstock end for clamping. The resulting cavity is filled with water, which dissipates enough grinding heat to prevent distortion.

In squaring off the end as we machine the tubes to length, the inside edge is slightly beveled to produce a better water seal. This bevel also helps to maintain the concentricity of the OD when the tubes are clamped on the arbor.

The major portion of the arbor is relieved to simplify installation of the seal ring next to the head. Round rubber seals, inserted in the ID of the seal rings, make water-tight joints between the rings and the arbor. Water enters the cavity through a hole in one of the seal rings. The other ring is similarly drilled to allow the displaced air to escape. Both holes are tapped to receive tapered pipe plugs.

R G Cavaiani, Iron Mountain, Mich



Shopmade Stethoscope Aids Trouble Shooting

We do considerable repair work on many types of engines. When an undefineable noise or knock proves hard to find, we turn to our shopmade stethoscope. It quickly tells us where to look for trouble.

An old discarded bottom-pressure type oil can, and a length of steel rod are the materials needed. The spout of the can is not used so it is thrown away. The rod is then soldered to the bottom of the can. The rod can be left as is, or it can be curved or bent at right angle as we did.

To probe an engine block, just rest the rod wherever the objectionable noise seems to originate Holding the open end of the oil can close to your ear, the diaphragm - amplified sound will quickly tell you what part of the engine is emitting the most noise.

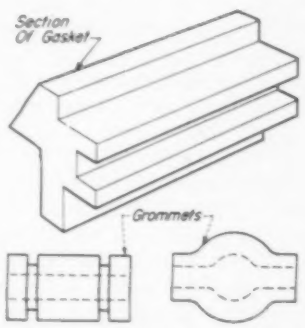
One word of caution: When probing a gasoline engine, stay clear of the sparkplugs. The spark can give you an awful jolt.

S. Clark, East Bradenton, Fla.

Deep-Frozen Rubber Is Machinable

One of the most difficult materials to machine is soft natural rubber. Our engineering department often requires us to make a sample part out of this material before a mold is designed and constructed. This means we must make use of our standard machining facilities, particularly sawing, turning, boring, and drilling.

To perform these operations the rubber must first be pre-treated. In its natural state, machining with any degree of accuracy would be impossible. The method we use is to freeze the rubber by either of two methods. One is by immersing it in liquid nitrogen, which today is commercially available in hermetically sealed containers. The other is a dry ice and acetone slush we make up. This is not as cold as liquid nitrogen, but it will do a good job if handled right. (Note: Liquid nitrogen boils at –320.4 F while dry ice gasifies at –110 F. Ed.) The time for freezing rubber in liquid nitrogen is generally less than one minute.

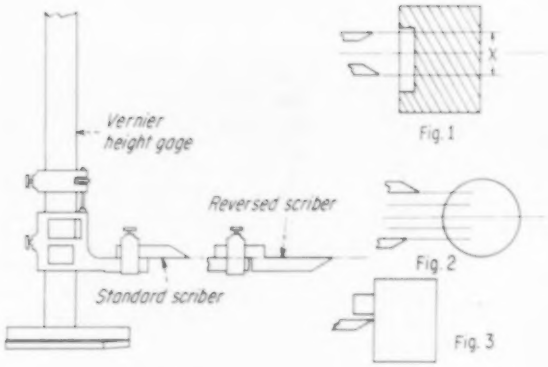


The next step is to arrange a method for rapid setups. In lathe work, the inside machining is done first. The work is then mounted on a mandrel and both are frozen together. Whatever the operation, machining should be limited to one pass.

A woodworking circular saw, equipped with a carbide-tipped blade, was used to produce a special line gasket—a section of which is shown in the sketch. The height of the blade and the fence setting were established with the help of a piece of scrap wood. The other samples shown are special grommets easily produced in the lathe by this process.

Edmund F Arrufat, Vestal, NY

Practical Ideas...



Reversed Scriber Cuts Layout Time

Every conscientious mechanic tries to find shortcuts to simplify his work. Whether he does so to make it easier on himself or not, the end result usually benefits all concerned.

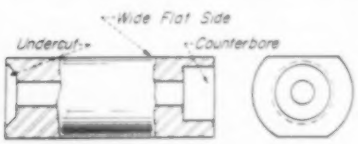
Some operations are easier than others in which to find ways of cutting corners. Precision layout work is one phase of metalworking where shortcuts are few and isolated. To illustrate some examples, Fig. 1, 2 and 3 show how the scriber on a height gage must be inverted to reach a hard-to-get-at location. When this is done, the height gage has to be reset to compensate for the height of the scriber. In other words, an extra manipulation is necessary, which many times may lead to miscalculations.

To eliminate both the hazard of errors and the extra operation, I designed the reversed scriber shown. It provides a reversed-scriber point without any change in gage setting, by simply substituting the regular with the reversed scriber.

Commercial flat-ground oil-hardening stock is used to make the scriber. Height and thickness of the shank are copied from the regular scriber. Assuming its shank and its point to be 0.300-in. high, the surest way to hold accuracy is to start out with a piece that can be finish ground to 0.600-in. wide.

When the piece has been hardened, after preliminary machining, the heights of the shank and the point are finished to 0.300-in. The point is then ground to the angle desired. An offset scriber, having the bottom face of its shank and the top of its point on the same plane, is thus produced.

Torsten Anderson, Brooklyn, NY



Angle Plug Replaces Angle Plate

The illustrated plug is one of several that I have been using for years in place of standard angle plates. They are handy for setting up work on drillpresses, milling machines, surface grinders, on the face plate of a lathe, or in any machining operation demanding a square angle support.

A set of 4 of these plugs will take care of most setups, but a variation of sizes, in both height and diameter, makes them even more versatile. We have them in heights from 4 to 8 in. with diameters from 2 to 3 in.

Taking the 4 x 2 in. plug as an example; the stock is chucked in the lathe and the OD is turned. The bolt hole is then drilled, bored, and reamed to 9/16 in.—standard for all plugs to insure concentricity when plug is ground on an arbor. The counterbore is machined to accept the type of capscrew head used, whether it be hollow-head or hexagonal. If the latter is used, allowance for a socket wrench must be made in the diameter of the counterbore.

The plug is then turned end-for-end and faced off, undercutting the central portion to form a rim-seating base. Two flats are milled on the side of the plug opposite each other. We made one flat wider than the other to provide a larger surface on which to mount the work. C-clamps are used for holding the work to the plugs, but if bolts are to be used for this purpose, holes must be drilled and tapped into the flats at this time.

After a plug is hardened it is mounted on an arbor and set up in a cylindrical grinder. The diameter and the two ends are ground in one setting for maximum accuracy.

While the plug is still mounted on the arbor, one of the flats is ground on a surface grinder with the ends of the arbor cradled in identical V-blocks. The finished side is then placed directly on the magnetic chuck to grind the second flat.

Raoul Monchamp, Manchester, NH

Soapstone Protects Straightedge

Fabricating machine components sometimes requires acetylene cutting by hand. A straightedge is then a great help in guiding the torch in straight-line cutting. There is only one little draw-back. Because of the nearness of the straightedge to the molten metal and slag, pitting quickly forms on the edge.

This can easily be prevented by giving the face, on which the torch glides, a heavy coating of soapstone. Pits will then be less likely to stick to this face, and the coating will, at the same time, act as a mild lubricant for the torch to glide on.

H Josephs, Gardenville, Penna

HJALMAR DAHL
Upplands Vasby, Sweden

won **$25** in addition to regular payment for his idea:

DIE ROLLS WIRE INTO SHELL EDGE

in the Dec 16, 1957 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

Our annual Production Planbook will reprint all winning ideas as a review. One will be chosen out of this issue as a winner of winners, and will receive a

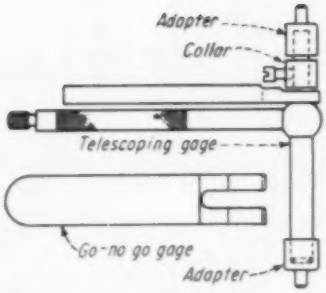
GRAND PRIZE OF $100.

JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.



Telescoping Gage with Adapters Checks Ring Grooves

Standard limit gages were used to check the widths of ring grooves in a small quantity of parts we recently had to produce. No problem there; but when the ID had to be measured we ran into difficulty. The number of parts were too small to warrant elaborate gages, so we did the next best thing. We improvised, using the tools we had.

The illustrated arrangement, which employs a telescoping gage, a pair of adapters, a collar, and a Go-No-Go gage, did the job with complete satisfaction. The cost of making these parts is negligible; and once made, they can be applied to any ID within the range of the telescoping gage.

The adapters were reduced in diameter to allow them to easily enter the grooves. They were then individually fitted to the legs of the telescoping gage. A collar was reamed and faced to fit the telescoping leg of the gage. A small setscrew holds it in place. In making the Go-No-Go gage, it must be remembered that its thickness has to be at least as thick as the depth of the groove or the gage will not enter.

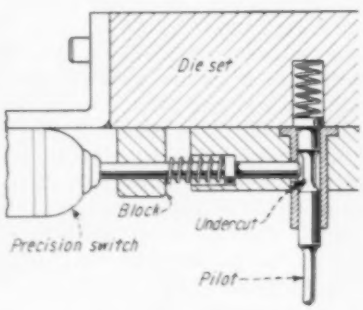
Gaging is done by first setting the gage to the ID of the groove, using an outside micrometer. With the gage located at this setting the collar is adjusted. Its relation to the spherical part of the handle is arrived at with the aid of the Go-No-Go gage. The adapters are then entered into the groove, and its diameter is checked by trying the Go-No-Go Gage between the collar and the sphere.

Benck England, Haifa, Israel

Spring-Loaded Pilot Stops Press Electrically

When misfeeding occurs in a progressive die, serious damage can be done to either punch or die, and possibly both; particularly if they are of necessity lightly constructed. Should there be no danger of breakage, a lot of material might instead be wasted while misfeeding goes undetected for a length of time.

To prevent mishaps we devised the illustrated pilot-activated switching arrangement. The only deviation from regular practice is that in preparing the punchholder one important pilot is spring loaded. In cases where the punchholder



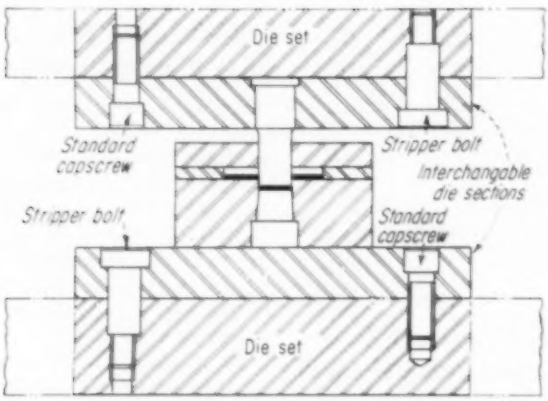
is too thin to guide the pilot, a bushing, as shown, will be necessary. A hole is then drilled and counterbored from the side of the holder into the bushing.

In addition, a bracket supporting a precision switch is mounted on the side of the die set. A push rod, also spring loaded, is the link between the switch and the pilot. It is guided by a block mounted close enough to the punchholder to back up the compression spring mounted on the rod.

The undercut on the pilot body provides the necessary clearance for the push rod. With the rod thus extended the normally closed switch is in ON position, completing the press-operating circuit. Should the stock be misfed the pilot will hit on top of the stock, causing the switch to break the circuit, stopping the press.

Norman W. Taylor, Hopedale, Mass

Practical Ideas...



Stripper Bolts Double As Dowels

Considerable savings can be realized in equipment and labor, when stripper bolts are used to serve two purposes in die construction. The illustration shows how we have replaced two of the four capscrews, in a simple piercing die, with two stripper bolts.

This method will allow a variety of die members to be used in a single die set, provided the mounting-plate holes are standardized. Each set of die members is then easily removed and replaced without disturbing the die set in the press.

The only addition to standard die makeup would be the mounting plate for the die. Both this plate, and the die half of the set, are without slug-clearance holes. Instead, slots are milled across the bottom of each die for slug ejection. But if the dies to be used in a particular die set will discharge slugs of some uniformity and placement, slug-clearance holes can be machined through both members.

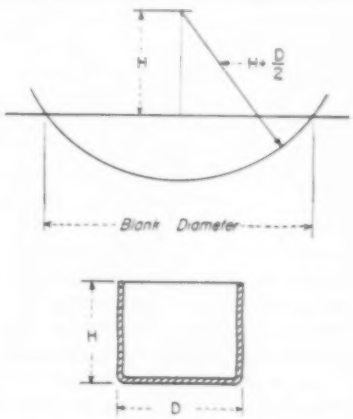
R K Dulek, Racine, Wis

[NOTE: It is obvious that the stripper bolts cannot be allowed to fit as snugly as conventional dowel pins. They have to rotate, so a sliding fit is necessary. Secondly, since the mounting holes in the die set are poor guides for drilling the die and punch plate, a drill plate for this purpose would seem essential. Ed]

Simple Arithmetic Determines Blank Diameters

Practically all handbooks dealing with metalworking and presswork devote a section to formulas for finding the proper diameter of a drawn cup blank. These are all very good, but all involve the use of higher mathematics, sometimes too complicated for the average shopman.

The method illustrated requires only a working knowledge of simple arithmetic. To find a blank diameter for a cup or shell with sharp corners, the first thing to do is to make a layout to establish a chord. A piece of sheet iron or aluminum makes a good base for the layout.



To get the radius for the cord, the height of the cup is added to half its diameter. Setting the dividers to this dimension, one leg is placed at the height line on the vertical and a radius is drawn. The points at which the radius intersects the horizontal line determine the blank diameter.

For cups with corner radii, find the arc lengths of the radii. The difference between the radii and the sharp corners is then subtracted from the blank diameter obtained in the layout.

W T Roberts, Springdale, Conn

Draglink Powers Tailstock

Deep-hole drilling, when done by turning the tailstock-hand wheel, is usually tiresome. The carriage-feed power can, instead, be harnessed to make the job much easier.

We have done it by linking the tailstock to the carriage with a quickly engageable and removable strap. It is now possible to stand by and watch the lathe take all the bull work out of this job.

Two holes were first drilled and tapped for two husky socket-head capscrews. One went into a solid part of the carriage, so it would not be weakened, and the other was placed on the tailstock directly in line with the first; also in strong material.

The link was made of a piece of flat steel. Two holes were laid out and drilled to allow the link to be dropped over the heads of the capscrews. The two holes should be spaced to keep the two components as close as possible without actually touching. A slight offset bend was put into the link to compensate for the difference in height of the two screw locations.

Before power feeding, all tailstock locking bolts must be loosened. The lathe bed is then thoroughly cleaned and oiled. Thumb tightening the locking bolts will permit the tailstock to slide without chatter or vibration. With the link in place the logitudinal feed is engaged and the drill is power fed into the work.

Lewis H Edwards, Wamego, Kansas

T-J spacemaker cylinder

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STREAMLINED DESIGN . . . Oil Pressure to 750 P.S.I.—air to 200 P.S.I. Standard at No Extra Cost!

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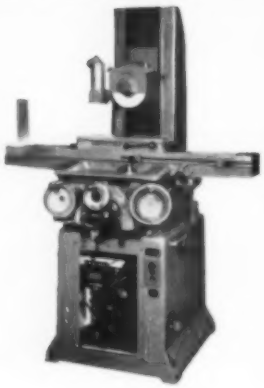
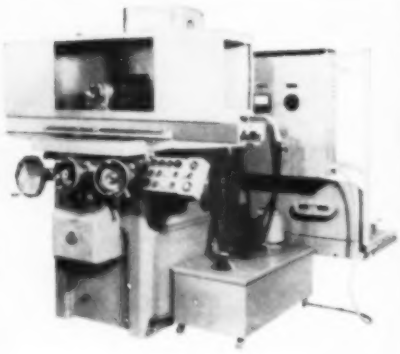
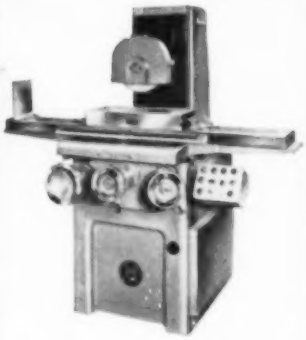


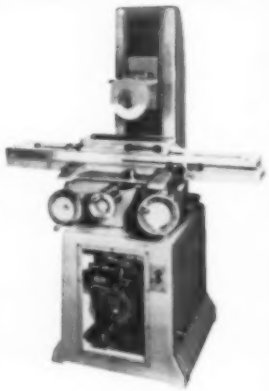
REID Model 618 P
Power Table Power Crossfeed



REID Germanium slicing machine

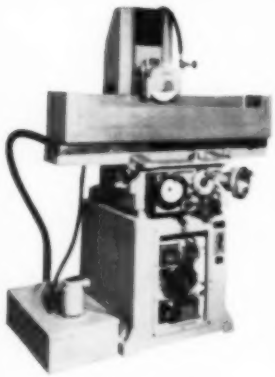


REID-O-MATIC 824
All Electric Production and Toolroom precision surface grinder



REID Model 618 H
Hand operated (Table and Crossfeed)

REID Electrolytic surface grinder



REID Model 618 PT
(Power Table Hand Crossfeed shown with wet grinding attachment)

Manufacturers of precision surface grinders for production and toolroom needs

REID Precision Surface Grinders meet a wide range of toolroom and production needs. As proof of this versatility REID Grinders are in everyday use in thousands of leading industrial plants.

Nearly 60 years of manufacturing experience are represented in REID Grinders, and our engineering contributions in this field of precision are a matter of record.

For low cost, dependable performance . . . specify REID . . . the quality Surface Grinder. Available in several sizes . . . write for descriptive literature today.

REID PRECISION SURFACE GRINDERS

REID BROTHERS COMPANY, INC. / 134A ELLIOTT ST. / BEVERLY, MASSACHUSETTS

Cold-Rolled Strip Steel—I

Table 1—Physical Properties of Cold-Rolled Strip Steel

Temper No.	Hardness Rockwell B	Yield Point, psi	Tensile Strength, psi	Total Elongation (Long. & Trans.)		Bend Test Requirements (No Evidence of Cracking)	Cup Ductility**	
				Thickness	% in 2 in.		Thickness	Min. Depth
1 (Hard)	To 0.070 in. Thick 90 min. 0.070 in. & Over 84 min.							
2 (Half Hard)	70 min. to 85 max.					Bend 90° across the direction of rolling around a thickness equal to that of the specimen.		
3 (Quarter Hard)	60 min. to 75 max.					Bend 180° across the direction of rolling and 90° in the direction of rolling around a thickness equal to that of the specimen.		
4 (Skin Rolled)	60 max.	35,000 max.	41,000 min.	0.010-0.014 incl. 0.015-0.024 0.025-0.033 0.034-0.061 0.062 & over	22 min. 27 min. 31 min. 33 min. 35 min.	Bend flat on itself in any direction.	0.030 0.036 0.042	0.359 0.375 0.390
5 (Dead Soft)	50 max.	33,000 max.	41,000 min.	0.010-0.014 0.015-0.024 0.025-0.033 0.034-0.061 0.062 & over	25 min. 30 min. 35 min. 37 min. 39 min.	Bend flat on itself in any direction.	0.030 0.036 0.042	0.374 0.390 0.406
K4 (Skin Rolled)	55 max.	30,000 max.*	41,000 min.	0.010-0.014 0.015-0.024 0.025-0.033	26 min. 31 min. 36 min.	Bend flat on itself in any direction.	0.030 0.036 0.042	0.384 0.400 0.416
K5 (Dead Soft)	45 max.	27,000 max.*	41,000 min.	0.034-0.061 0.062 & over	38 min. 40 min.			

* *Yield Strength 0.2% offset.*
** *As determined by cup ductility test (⅝ in. ball). For thicknesses other than those indicated, add or subtract 2.75 times the difference in thickness.*
GRAIN SIZE *for all tempers should be ASTM 6 to 8.*
MICRO CLEANLINESS *for all tempers should be ASTM, AsT, BzT, DzT max.*

These data explain the quality of cold-rolled strip steel used in applications involving decorative or structural functions, or both. Painting or plating of the product may be required. In the automotive industry, a symbol system is employed to designate physical properties, surface finish, and freedom from surface imperfections. Code symbols, as shown in the tables, may be made part of a specification. For example:

FIRST SYMBOL:

No. 1, 2, 3, 4, 5, or 0—denotes temper of steel and desired physical properties. Table 1. Use the prefix "K," if the special properties of killed steel are required. Use of a zero indicates that temper and physical properties are not part of the specification.

SECOND SYMBOL:

No. 1, 2, 3, 4, 6, 9 or 0—denotes class of finish and surface-finish limits. Table II.

THIRD SYMBOL:

No. 1, 2, 3, 4, 5, or 0—denotes grade and surface irregularity limits for the application. Table 3.

FOURTH SYMBOL:

Letter Y, Z or O—denotes irregularity limits imposed by forming requirements. Table 3.

Example: 421 Y—denotes that the part must withstand moderate to severe forming and is finished by decorative plating, and that the part's appearance is important.

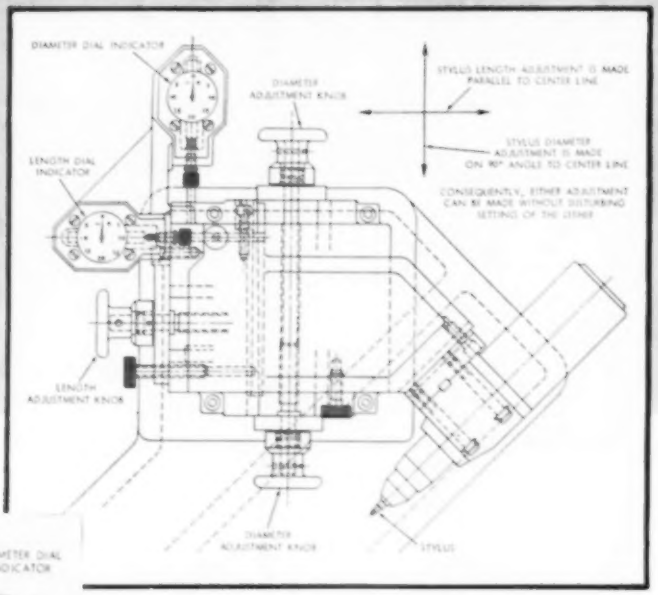
CHEMICAL COMPOSITION

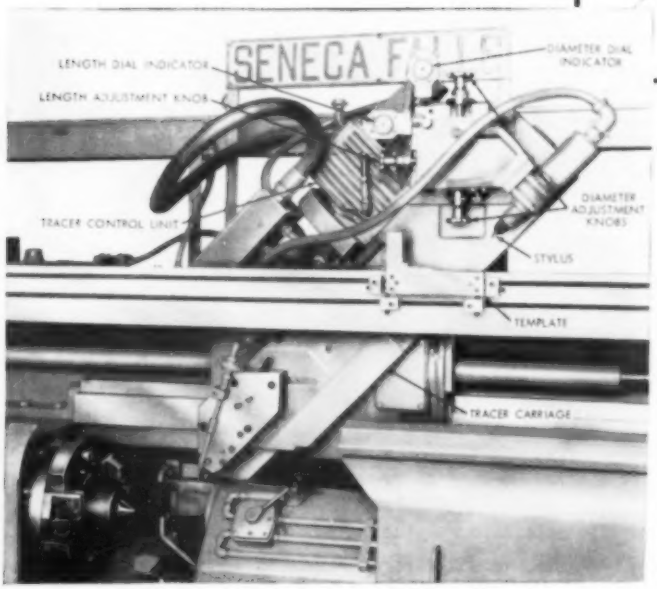
One automotive company says that cold-rolled strip steel should conform to these composition limits: carbon, 0.13% max; manganese, 0.25-0.60%; phosphorous, 0.040% max, and sulfur, 0.050% max. Chemical composition is normally subordinate to satisfactory performance. Residual elements in the steel should not affect adversely the fabricating or finishing characteristics of the material. *Continued on page 133*

American Machinist REFERENCE BOOK SHEET

YOU CAN SET TOOLS IN SECONDS

on this SENECA FALLS TRACER LATHE





Where it used to take minutes by the old "cut and try" method, it now takes only seconds to adjust tools on the new Seneca Falls Model Q Automatic Tracer Lathes. Diameter and shoulder length accuracy are controlled by the stylus which is adjusted by means of compound slides operating in conjuction with two dial gages. One dial indicates diameter, while the other indicates shoulder length. The operator simply takes an initial cut over the work piece and sets the dials to zero. The work piece is then checked with micrometers to obtain out-of-tolerance readings, after which the stylus is accurately adjusted in one setting, by turning the slide adjustment knobs until the hands on the dials indicate the correct amount of stock removal. After the stylus is properly adjusted for size and length, the hands on the dials are again set at the zero mark.

Diametral and length adjustments are made by the "straight line" method, which does not affect either adjustment when feeding in the tracer slide. See line drawing for explanation.

Another advantage of the dial gages is that tool adjustment for wear is visually indicated on the dial and permits resetting the stylus to zero position when the tool insert is indexed or changed for a fresh cutting edge.

The dial indicator system facilitates a fast changeover from one part to another when used in conjunction with templates designed to compensate for variations in size of the work pieces. This method eliminates even the initial "trial cut," as the first piece turned is accurately machined to the specified dimensions.

SENECA FALLS MACHINE

ENGINEERED FOR PROFIT

SENECA FALLS MACHINE CO.

SENECA FALLS, NEW YORK

Lo-swing Lathes and Seneca Falls Machine Tools, Automation and Electronics

Cold-Rolled Strip Steel—II

Table 2—Strip-Steel Surface Classifications

Classification	Roughness Range Arithmetic Average	Surface Evaluation
Class 1 Extra fine finish	Under 10 microinches	Surface suitable for decorative plating or painting without any special surface preparation.*
Class 2 Fine finish	10-20 microinches	Surface suitable for decorative plating if polished; also for decorative painting without special surface preparation.*
Class 3 Medium finish	20-30 microinches	Surface not suitable for decorative plating; suitable for decorative painting with minimum surface preparation.*
Class 4 Medium coarse finish	30-40 microinches	Surface not suitable for decorative plating; suitable for decorative painting with surface preparation.*
Class 6 Coarse finish	40-60 microinches	Surface not suitable for decorative plating; suitable for decorative painting with considerable surface preparation.*
Class 9 Extra coarse finish	Over 60 microinches	Surface not suitable for either decorative plating or decorative painting.

** Definition of "surface preparation" as used above means the elimination of the effects of surface roughness either by polishing the metal before coating and/or the use of sanded undercoats; methods which would cut down the peak to valley heights.*

Table 3—Surface Irregularity Limits X indicates that the specific irregularity is permitted

Surface Irregularity	Grade 1		Grade 2		Grade 3		Grade 4		Grade 5	
	Y	Z	Y	Z	Y	Z	Y	Z	Y	Z
1. Pinchers							x	x	x	x
2. Coil Breaks							x	x	x	x
3. Sticker breaks							x	x	x	x
4. Floppers							x	x	x	x
5. Orange peel							x	x	x	x
6. Stretcher strains							x	x	x	x
7. Pipes										
8. Skin laminations								x		x
9. Slivers								x		x
10. Friction gouges or scratches								x		x
11. Healed-over scratches						x		x		x
12. Rolled in dirt, scab or metal										x
13. Small pits			x	x	x	x	x	x	x	x
14. Large pits and holes										
15. Rust										
16. Oxidized surface										x
17. Pickle patch									x	x
18. Pickle stain			x	x	x	x	x	x	x	x
19. Loose metal										
20. Damaged edges										
21. Coil weld	x	x	x	x	x	x	x	x	x	x

The following typical manufacturing operations indicate applications of grades:

Grade 1—DECORATIVE PLATED PARTS
Grade 2—DECORATIVE PAINTED PARTS
Grade 3—EXPOSED PAINTED PARTS
Grade 4—CONCEALED WELDED PARTS
Grade 5—CONCEALED PAINTED PARTS

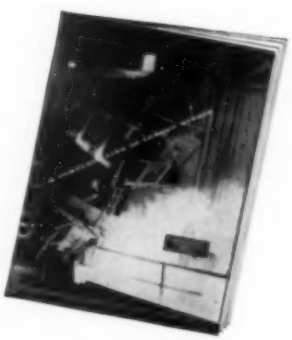
Sub-Grade Y—PARTS IN WHICH MANUFACTURE INVOLVES MODERATE TO SEVERE DEFORMATION (DEEP DRAWING, CUPPING, FLANGING, CRIMPING, SEVERE BENDING)
Sub-Grade Z—PARTS IN WHICH MANUFACTURE INVOLVES LITTLE OR NO DEFORMATION (SIMPLE BENDS, LARGE RADII, PIERCING, BLANKING OR FLAT PIECES)

ARISTOLOY BEARING QUALITY STEELS MEET EXACTING REQUIREMENTS OF BEARING MANUFACTURERS

Uniformity . . . minimum size and minimum frequency of non-metallic inclusions, freedom from segregation . . . these qualities are synonymous with the electric furnace process. They are also the prime requirement of bearing grade steels.

Here at Copperweld, careful selection of raw materials, precise melting in electric furnaces, and special care during teeming, produce Aristoloy—a steel which excels bearing grade steels made by any other method.

Available in 52100, 4620, 4720, 8620, and 4320, Aristoloy can be furnished in hot rolled or cold drawn, annealed (spheroidized annealed where required), rough turned, and turned, ground and polished. For assistance in selecting the best Aristoloy for your job, call or write. A qualified Copperweld Field Metallurgist will be glad to work with you.



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ARISTOLOY STEELS

Inch-Millimeter Conversion Tables

GUSTAV HIRSCH, technical manager, CHANITA METAL WORKS, CHANITA, ISRAEL

This corrected table replaces the one published Dec. 30, 1957, p. 107

TABLE I:

Fractional inches to decimal inches — 0 to 1 in. by 64ths
Fractional inches to millimeters — 0 to 6 in. by 64ths

Inches		Millimeters					
		0"	1"	2"	3"	4"	5"
0	0	—	25.400	50.800	76.200	101.600	127.000
1/64	0.015625	0.397	25.797	51.197	76.597	101.997	127.397
1/32	0.031250	0.794	26.194	51.594	76.994	102.394	127.794
3/64	0.046875	1.191	26.591	51.991	77.391	102.791	128.191
1/16	0.062500	1.588	26.988	52.388	77.788	103.188	128.588
5/64	0.078125	1.984	27.384	52.784	78.184	103.584	128.984
3/32	0.093750	2.381	27.781	53.181	78.581	103.981	129.381
7/64	0.109375	2.778	28.178	53.578	78.978	104.378	129.778
1/8	0.125000	3.175	28.575	53.975	79.375	104.775	130.175
9/64	0.140625	3.572	28.972	54.372	79.772	105.172	130.572
5/32	0.156250	3.969	29.369	54.769	80.169	105.569	130.969
11/64	0.171875	4.366	29.766	55.166	80.566	105.966	131.366
3/16	0.187500	4.762	30.162	55.562	80.962	106.362	131.762
13/64	0.203125	5.159	30.559	55.959	81.359	106.759	132.159
7/32	0.218750	5.556	30.956	56.356	81.756	107.156	132.556
15/64	0.234375	5.953	31.353	56.753	82.153	107.553	132.953
1/4	0.250000	6.350	31.750	57.150	82.550	107.950	133.350
17/64	0.265625	6.747	32.147	57.547	82.947	108.347	133.747
9/32	0.281250	7.144	32.544	57.944	83.344	108.744	134.144
19/64	0.296875	7.541	32.941	58.341	83.741	109.141	134.541
5/16	0.312500	7.938	33.338	58.738	84.138	109.538	434.938
21/64	0.328125	8.334	33.734	59.134	84.534	109.934	135.334
11/32	0.343750	8.731	34.131	59.531	84.931	110.331	135.731
23/64	0.359375	9.128	34.528	59.928	85.328	110.728	136.128
3/8	0.375000	9.525	34.925	60.325	85.725	111.125	136.525
25/64	0.390625	9.922	35.322	60.722	86.122	111.522	136.922
13/32	0.406250	10.319	35.719	61.119	86.519	111.919	137.319
27/64	0.421875	10.716	36.116	61.516	86.916	112.316	137.716
7/16	0.437500	11.112	36.512	61.912	87.312	112.712	138.112
29/64	0.453125	11.509	36.909	62.309	87.709	113.109	138.509
15/32	0.468750	11.906	37.306	62.706	88.106	113.506	138.906
31/64	0.484375	12.303	37.703	63.103	88.503	113.903	139.303
1/2	0.500000	12.700	38.100	63.500	88.900	114.300	139.700
33/64	0.515625	13.097	38.497	63.897	89.297	114.697	140.097
17/32	0.531250	13.494	38.894	64.294	89.694	115.094	140.494
35/64	0.546875	13.891	39.291	64.691	90.091	115.491	140.891
9/16	0.562500	14.288	39.688	65.088	90.488	115.888	141.288
37/64	0.578125	14.684	40.084	65.484	90.884	116.284	141.684
19/32	0.593750	15.081	40.481	65.881	91.281	116.681	142.081
39/64	0.609375	15.478	40.878	66.278	91.678	117.078	142.478
5/8	0.625000	15.875	41.275	66.675	92.075	117.475	142.875
41/64	0.640625	16.272	41.672	67.072	92.472	117.872	143.272
21/32	0.656250	16.669	42.069	67.469	92.869	118.269	143.669
43/64	0.671875	17.066	42.466	67.866	93.266	118.666	144.066
11/16	0.687500	17.462	42.862	68.262	93.662	119.062	144.462
45/64	0.703125	17.859	43.259	68.659	94.059	119.459	144.859
23/32	0.718750	18.256	43.656	69.056	94.456	119.856	145.256
47/64	0.734375	18.653	44.053	69.453	94.853	120.253	145.653
3/4	0.750000	19.050	44.450	69.850	95.250	120.650	146.050
49/64	0.765625	19.447	44.847	70.247	95.647	121.047	146.447
25/32	0.781250	19.844	45.244	70.644	96.044	121.444	146.844
51/64	0.796875	20.241	45.641	71.041	96.441	121.841	147.241
13/16	0.812500	20.638	46.038	71.438	96.838	122.238	147.638
53/64	0.828125	21.034	46.434	71.834	97.234	122.634	148.034
27/32	0.843750	21.431	46.831	72.231	97.631	123.031	148.431
55/64	0.859375	21.828	47.228	72.628	98.028	123.428	148.828
7/8	0.875000	22.225	47.625	73.025	98.425	123.825	149.225
57/64	0.890625	22.622	48.022	73.422	98.822	124.222	149.622
29/32	0.906250	23.019	48.419	73.819	99.219	124.619	150.019
59/64	0.921875	23.416	48.816	74.216	99.616	125.016	150.416
15/16	0.937500	23.812	49.212	74.612	100.012	125.412	150.812
61/64	0.953125	24.209	49.609	75.009	100.409	125.809	151.209
31/32	0.968750	24.606	50.006	75.406	100.806	126.206	151.606
63/64	0.984375	25.003	50.403	75.803	101.203	126.603	152.003

1 mm = 0.0393701 in. 1 in. = 25.4 mm

mm	In./mm	In.	mm	In./mm	In.	mm	In./mm	In.	mm	In./mm	In.	mm	In./mm	In.	mm	In./mm	In.
25.4	1	.039370	533.4	21	.826772	1041.4	41	1.614173	1422.4	56	2.204724	1803.4	71	2.795276	2184.4	86	3.385827
50.8	2	.078840	558.8	22	.866142	1066.8	42	1.653543	1447.8	57	2.244094	1828.8	72	2.834646	2209.8	87	3.425197
76.2	3	.118110	584.2	23	.905512	1092.2	43	1.692913	1473.2	58	2.283465	1854.2	73	2.847106	2235.2	88	3.464567
101.6	4	.157480	609.6	24	.944882	1117.6	44	1.732283	1498.6	59	2.322835	1879.6	74	2.913386	2260.6	89	3.503937
127.0	5	.196850	635.0	25	.984252	1143.0	45	1.771654	1524.0	60	2.362205	1905.0	75	2.952756	2286.0	90	3.543307
152.4	6	.236220	660.4	26	1.023622	1168.4	46	1.811024	1549.4	61	2.401575	1930.4	76	2.992126	2311.4	91	3.582677
177.8	7	.275591	685.8	27	1.062992	1193.8	47	1.850394	1574.8	62	2.440945	1955.8	77	3.031496	2336.8	92	3.622047
203.2	8	.314961	711.2	28	1.102362	1219.2	48	1.889764	1600.2	63	2.480315	1981.2	78	3.070866	2362.2	93	3.661417
228.6	9	.354331	736.6	29	1.141732	1244.6	49	1.929134	1625.6	64	2.519685	2006.6	79	3.110236	2387.6	94	3.700787
254.0	10	.393701	762.0	30	1.181102	1270.0	50	1.968504	1651.0	65	2.559055	2032.0	80	3.149606	2413.0	95	3.740157
279.4	11	.433071	787.4	31	1.220472	1295.4	51	2.007874	1676.4	66	2.598425	2057.4	81	3.188976	2438.4	96	3.779528
304.8	12	.472441	812.8	32	1.259843	1320.8	52	2.047244	1701.8	67	2.637795	2082.8	82	3.228346	2463.8	97	3.818898
330.2	13	.511811	838.2	33	1.292213	1346.2	53	2.086614	1727.2	68	2.677165	2108.2	83	3.267717	2489.2	98	3.858268
355.6	14	.551181	863.6	34	1.338583	1371.6	54	2.125984	1752.6	69	2.716535	2133.6	84	3.307087	2514.6	99	3.897638
381.0	15	.590551	889.0	35	1.377953	1397.0	55	2.165354	1778.0	70	2.755906	2159.0	85	3.346457	2540.0	100	3.937008
406.4	16	.629921	914.4	36	1.417323												
431.8	17	.669291	939.8	37	1.456693												
457.2	18	.708661	965.2	38	1.496063												
482.6	19	.748031	990.6	39	1.535433												
508.0	20	.787402	1016.0	40	1.574803												

TABLE II:

Inches to millimeters — 1 to 100 in. by 1-in. steps
Millimeters to inches — 1 to 100 mm by 1-mm steps

ALLENPOINT will give you a bulldog grip at no premium in price!

Allen's scientific redesign of the cup diameter on set screws gives greatly increased resistance to *withdrawal* torque. You can count on Allenpoint Set Screws to stay tighter longer, under heavy strain and vibrations. This dependable premium performance of Allenpoints is yours to use without increasing the cost of manufacturing your products.

Uniform Class 3A Threads

Allenpoints' smooth, uniform threads prevent off-lead conditions like Fig. 1. With Allenpoints, you have full, even contact between the engaging flanks of the threaded members (Fig. 2) —and a tight friction lock over the entire length of the Allenpoint Set Screw.

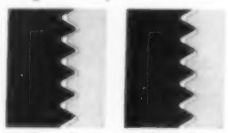
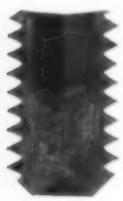


Fig. 1 Fig. 2

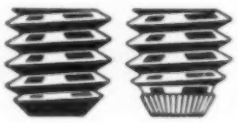
Strong, clean, deep sockets allow full wrenching leverage



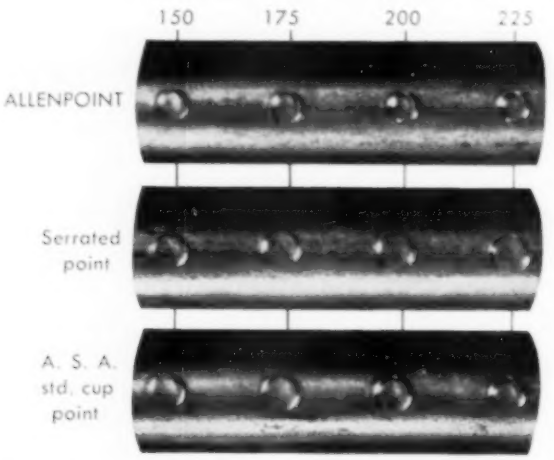
Sockets of Allenpoint Set Screws are cold forged to produce a deeper, smoother socket. No broach chips to interfere with proper seating of the key. This "pressur-forming" preserves the long steel fibers throughout the length of the screw—stronger walls allow maximum tightening torque.

One more full thread on ALLENPOINTS!

Allenpoint Set Screws have one more full thread than serrated point set screws. That means more holding power—especially important when you're using short lengths.



ALLENPOINT's performance compared for you



These actual-size, unretouched photographs show the cup pattern made by Allenpoints, serrated points, and A.S.A. standard cup point set screws in a 3/4" steel shaft. At each degree of tightening force, Allenpoints make a full circle pattern, penetrating deeper for greater holding power.

We'll be glad to send you more information and samples of Allenpoint Set Screws and other Allen Socket Screw products.

Stocked and sold by leading industrial distributors everywhere

ALLEN MANUFACTURING COMPANY
Hartford 2, Connecticut, U.S.A.

ALLEN HEAD HEX-SOCKET SCREWS

Talking Shop...

Spare That Axe!

DON'T GET CARRIED AWAY by the need for cost reduction to the point that you make across-the-board reductions. Such an approach might lead to the result in one plant where maintenance costs were cut from 2.4% to 2.0% of sales. The saving looked good, but direct labor went up because of increased downtime. This sad case is cited by Alexander Borden, a consultant, in warning that saving minor visible costs may lead to major increases in hidden costs unless you cut with a scalpel instead of an axe.

Sintered Humps

HEAVY-DUTY HAMMERS are lasting longer by welding sintered "hard metal" (probably a form of carbide) to the surface by a firm in Vienna. The coating is applied continuously along the edges, but in humps or globules scattered over the surface. Completely covering the surface leads to breakage. Our guess is that such lumpy tool surfaces would be limited to rather rough work. Breaking stone, perhaps.

Plating Racks

STANDARD PARTS can be used to build up plating racks that are easy to change to suit new products. In addition, if one of the parts is damaged it can be replaced more easily than a one-piece rack can be repaired. Each part is made of copper covered with a molded plastic coating. Plastic caps cover the bolts used to assemble the rack. We hear that the Hypalon-coated racks have a stronger bond between copper and plastic than the coating itself. Thus, if there is a tear in the plastic, plating solution does not seep under the edges of the coating and eat away the copper.

Missile Machines

THE MOST FREQUENT question we hear these days is "What kind of machines will be required to make missiles?" As nearly as we can tell, there is no simple answer to that question. There are few missiles yet in quantity production. Methods vary widely on these and no clear pattern has emerged. But we have some unofficial ideas.

First, and foremost, we think that eventually more machines will be required in making missiles than have been used in building airplanes. We base this conclusion on the quantities involved and the precision that will be required. Where aircraft skin is routed, missile skin is more likely to be blanked.

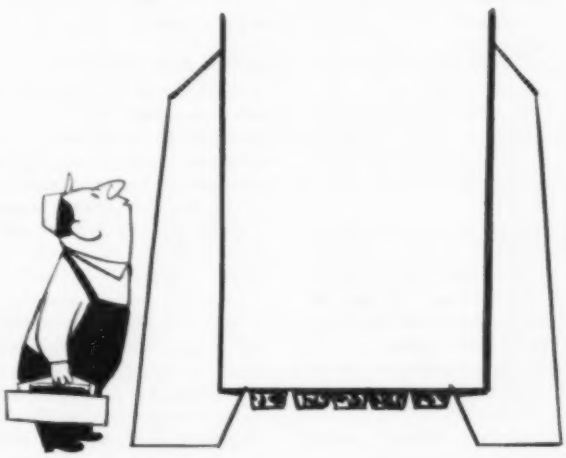
Inside the missile goes a complex system of pumps, controls, gyros, and electronic equipment. The total may not be as great as in a single airplane, but then quantity will be higher. As more missiles go into mass production, we'll have a clearer picture of the production equipment used. We're betting, however, that the ratio of machines to men will be a good deal higher than in the airframe plants.

Tape Center

MAGNETIC TAPES for machines with numerical control will be turned out for West Coast aircraft firms on a director unit installed at Convair-San Diego by the Air Force. The unit will produce the tapes for Boeing, Douglas, Lockheed, and Rohr, in addition to serving the two skin mills recently installed at Convair.

Vacation Schedules

WITH VACATIONS GETTING LONGER, more companies are having trouble with the scheduling of vacations. As you know, many plants have settled this problem with a plantwide closing in which everyone takes his vacation at the same time. But not all plants can do this. You may be interested in an alternate plan that has been adopted by Milwaukee Gear Co. All who can are encouraged to take their vacation at other than the popular June-August period. Those who can only take their vacations during this period must schedule them during one four-week period in which the second shift is eliminated and non-vacationing second shifters are integrated into the first shift. Seniority settles both the questions on conflict in choice of weeks off in the month (two weeks is the limit) and the assignment of jobs for those who remain behind. This provides more flexibility than a plant closing, and better service to customers.



NEWS REPORT...

There'll Be Some Changes Made

WASHINGTON—The Defense Dept's long-planned Advanced Research Projects Agency (ARPA) has finally been set up to direct the burgeoning program for development of anti-ICBM defenses and military space hardware. Roy W Johnson, a General Electric Co vice president, has been named Director.

Although ARPA's operating procedures have still to be spelled out precisely, the new agency's charter shows that defense contractors active in these two general projects will now be subject to more centralized Pentagon control than in the past.

ARPA has a general mandate for "the direction and performance of certain advanced research and development projects." But the new agency will farm out to the individual military services contracting responsibilities for most if not all of the development projects in the anti-ICBM and space weapon fields.

The Air Force, for instance, will continue to administer contracts for the Ballistic Missile Detection Program—estimated to cost close to $1 billion—and the Army for the Nike-Zeus anti-missile missile project (Western Electric and Douglas Aircraft are the major contractors).

This means space contractors will continue to deal directly with the Services on payments facilities and the like. But space project proposals to the services will now have to be approved by ARPA.

The new agency's power stems from its control of the purse strings for anti-ICBM defense, space weapons—space vehicles, reconnaissance platforms, and such—and "other advanced (military) projects" which are beyond the traditional roles and missions of the individual services. Such funds will now be appropriated by Congress directly to ARPA rather than to the Air Force, Army, or Navy.

ARPA has a $10-million budget to cover the next four months and a $340-million fund now pending before Congress for fiscal 1959, starting next July 1. The agency, however, will have unusual authority over anti-ICBM defense and space weapon money already appropriated to the individual Services. The first prime contract on the Ballistic Missile Detection System is expected to total $329-million alone. (The contract, now being processed, goes to RCA as the prime, and to Western Electric, General Electric, Sylvania, and several other electronic companies as major subcontractors.)

Although the new agency is authorized to award contracts on its own and to build new research facilities, it expects to work through the Services on weapon systems and through civilian government agencies like NACA and AEC on more general space science research. The agency, which will consist of some

Justice Dept. Gives Machine Tool

WASHINGTON — Attorney General William P Rogers has filed his report with Congress on what effect government expansion of machine tool supply under the Defense Production Act of 1950 has had on competition in the machine tool industry.

The principal conclusions:

- Although there are "some indications of a trend toward concentration" in the industry, the general outline of the industry "still presents the appearance of a broad competitive structure"; and
- Although "final conclusions" demand more examination, government policies "probably" have had no direct bearing on this trend toward concentration.

The Justice Dept report shies away from making hard and fast statements about competition in the industry. And nowhere in the 60 pages of text devoted to machine tools does the report make recommendations for Congressional action or changes in existing government policies.

The report was prepared under the Defense Production Act requirement that the Attorney General make regular quarterly reports to the President and Congress on any aspect of the law's operation in an industry that may be hurting small business or promoting "undue concentration of economic power." Many other industries have already been studied under this provision and antitrusters say the machine tool industry is "just getting its turn."

No Tax Discrimination

Tracing the industry's development from 1938, the report hits the high spots of the Korean emergency expansion program and Korean accelerated tax amortization. On amortization, Rogers says his examination —though limited by a lack of detailed industry structure figures— reveals "little probability" that amortization "discriminated against any general segment of the industry." Rogers also concludes that the denials of requested tax amortization under the program were "relatively inconsequential."

Complaints that have come from various sources—inside and outside the industry—about possible anti-competitive aspects of government machine tool policies are not ignored entirely in the report, but critics will find little support for their complaints.

143,000 US Tools on Loan

The reports says about 143,000 tools have been placed by the Defense Dept in the hands of defense contractors. It concludes that while use of such government-owned tools in non-defense production "may once have been a problem," Office of Defense Mobilization regulations on this—permitting such use in extraordinary cases—are in the "best interest" of national defense. Furthermore, says the report, "the amount of non-defense use is presently minimal."

The report specifically stays off the problem posed by government surplus disposal, though it recoganizes that government tools in private hands today present problems "similar" to those faced by the industry in the World War II surplus disposal program. This problem is not dis-

As US Readies for Space Age

25 Pentagon scientists and engineers, will have a role somewhat smaller than originally conceived.

The administration's plan to set up ARPA was almost snagged because of strong Congressional opposition to Pentagon domination of space explorations. Indeed, the issue—reminiscent of the controversy a decade ago over civilian or military control of atomic energy—has still not been fully resolved.

In addition to its direction of space weapon development, ARPA will coordinate most of the government's general space science research for up to a year—or until the administration and congress iron out full details for over-all civilian control of the space program.

Just as there was resistance to military control of the Atomic Energy Program, there is strong opposition in Congress and the scientific community to placing the space program under Pentagon direction.

Advocates of civilian space control believe the implications of space technology are too wide-ranging to allow military domination of the program. They argue that if the Defense Dept were to run the show, the search for general scientific knowledge would be underplayed in the push to build military hardware.

It cannot be said, though, that the Pentagon has actively contended for overall responsibility over space exploration—both weapons development and general space science research. But the military brass worry that the introduction of new civilian authority into the program might delay weapon development and divert defense money to basic scientific research, an effort they say should be financed by special appropriations.

A White House science advisory group, headed by the President's Special Assistant for Scientific Affairs, Dr James R Killian, is putting together a blueprint setting forth the scientific timetable for US space exploration and the bureaucratic scheme for running the program. The plan will tie into the administration's upcoming package of military reorganization proposals.

At the same time, a special Senate committee on astronautical and space exploration is trying to frame a comprehensive "national policy toward the Age of Space." In the offing is basic legislation for space affairs, comparable in scope to the Atomic Energy Act of 1946.

From both these studies, experts believe, will come a plan for a civilian agency—AEC, NACA, or a new bureau—to have overall authority for space exploration. On development and production of space weapons, the Pentagon will work jointly with the civilian agency—exploiting the civilian-directed space technology for military purposes, and awarding the contracts to build the hardware for space warfare.

Industry Clean Bill of Health

cussed, says the report, because "no general program has yet been esablished for large-scale disposals."

On the lack of uniformity in tool leasing policies, the report says the recent ODM directive, setting up uniform rental and leasing rates, should bring "improvement." This will make it possible to "prevent an unnecessarily heavy threat to the machine tool industry, principally to its smaller and weaker members." The report does imply this is necessary to prevent impairment of the necessary mobilization base in a critical industry .

But the report notes that Armed Services "offset" contracts cover by far the greatest number of government-owned tools in private use and these contracts were not drafted to conform with the new ODM directive. It also points out—but does no more than that—Armed Services procurement regulations have not yet been amended to conform.

On the competitive structure of the industry, Attorney General Rogers says he is "reluctant" to do more than make a "tentative determination" because much of the necessary information on the complex industry is "unfortunately unavailable to us."

Information Lacking

Rogers says this lack of information is due partly to the confidential nature of company information reported to government agencies, such as the Bureau of the Census, and a reluctance on the part of companies queried by the Justice Dept to respond.

Rogers said he sent questionnaires to 42 builders of metal-cutting machines and 20 builders of forming and shaping machines, asking for sales by product categories for a 10-year period ending third quarter 1957. From the replies, Rogers says he got less than 45% coverage, in terms of value of shipments, in the overall cutting field; less than 50% in the overall forming and shaping field.

"Unfortunately," Rogers says, "the companies failing to reply were in many instances the largest in the industry."

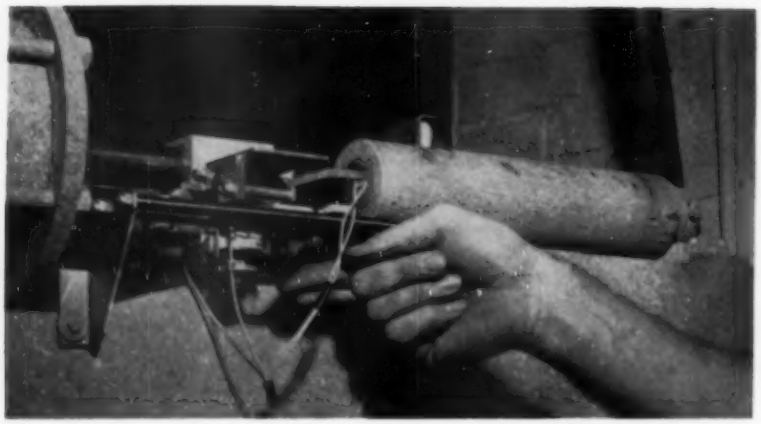
Returns in one category—lathes—were complete enough, however, to make a conclusion: There has been no significant growth in concentration in the production of lathes in the last eight years.

Generally, though the number of companies in the industry has declined from 403 in 1952 to 367 today, the industry appears broadly competitive.

"Some Concentration"

Here is some of the evidence Rogers uses to back up his conclusion that there is "some tendency" toward concentration:

- The 24 largest producers of cutting type tools have made 61% of all such tools in the first nine months of 1957; in 1952, the same 24 companies made only 52.4%. In the same period, the number of producers declined from 305 to 277.
- The 20 largest producers of forming and shaping tools made 79.5% of the total; in 1952, these producers accounted for only 63%. And the number of producers declined from 98 in 1952 to 90 in 1957.



Temperature-sensing riveter...

Temperature-sensing control for the automatic riveter shown above, was developed at Boeing Seattle. It insures that the rivet is driven automatically when the correct heat is reached. The control (right) consists of a sensing arrangement that is used in conjunction with a predetermined electrode dwell pressure while the rivet is being heated—sensing correct riveting temperature by the yield of the rivet. Then enough additional pressure is applied to head the rivet. Machine eliminates: cracking if rivets are too cold, oxygen contamination if they are too hot, and resetting for varying rivet lengths

Radioisotopes Come into Their Own

WASHINGTON — Radioisotopes are fast gaining acceptance by metalworking for a wide variety of applications—and for two reasons: they save a company money and at the same time improve its quality control.

Those are the findings of an extensive survey conducted by Machinery & Allied Products Institute's Council for Technological Advancement.

Polling a wide segment of industry, MAPI found several current uses for radioisotopes in both large and small metalworking companies. For example:

- Industrial research: irradiated tools or parts measure wear of cutting tools, pistons, and wire-drawing dies.
- Radiography can be substituted for X-rays in inspection of steel castings and welded joints.
- Radioisotopic gages can measure and control the thickness of steel as well as paint, paper, rubber and other products.
- Tracers can follow the flow of liquids in many applications.
- Radioisotopes can be used to radiate low-intensity light in such plant applications as exit signs, storage bins, traffic markers.

MAPI estimates the market for thickness gages alone is less than 10% saturated, even though such machines frequently pay for themselves within a year. Currently, according to the Atomic Energy Commission, industry is saving a minimum per year of $18.5 million by using radioisotopic metal thickness gages, $28.7 million by using radiographic testing, $800,000 on tool wear studies, $12 million on piston ring studies, and $3 million on corrosion studies. In all, savings effected by use of radioisotopes by all industry amounted to somewhere around $400 million last year alone.

More Producers Now

Number of producers of radioisotopes has increased markedly to keep pace with more usage by industry. Today, there are upward of 100 producers turning out Cobalt-60 and other radioisotopes. Result is that production is now up to demand. Further expansion is dependent upon increased industrial acceptance.

Of particular interest to metalworking, is MAPI's report on the use of radioisotopes to measure metal wear. It is estimated that time may be cut 75% and labor 90% in testing the wear of metals and of metal-cutting tools. The radioisotopic method has been found to be so sensitive in comparison with conventional measuring methods that wear frequently can be measured in just a few minutes of running time.

Currently about 500 companies are using radioisotopes as a substitute for x-rays in radiographic testing. A Cobalt-60 source can provide as much energy for testing as does a 1-million-volt x-ray machine—which costs nearly $100,000.

Radioisotopes for Gaging

In gaging, radioisotopes automatically measure and control the thickness of metals during production by the simple expedient of placing the metal between the source of radiation and a detection device. If more or less than the predetermined amount of radiation is detected, the machine may be automatically corrected, or it can be turned off for adjustment. Tolerances from 0.5 to 2% can be maintained by this method.

Built-In Devices

MAPI suggests that static eliminators, thickness gages and detection devices be built into new machines (they're attached now). This would (1) make more efficient use of radioisotopic devices, and (2) cut overall costs of installation. Too, such built-in devices could lead to vastly increased use of radioisotopes.

Metal Fibers Reinforce Plastic Dies

CHICAGO — Press forming and drawing dies, stretch dies, fixtures, gages and other tools can now be made with metal or glass-fiber reinforced plastic, it was reported at the Thirteenth Annual Conference of SPI's Reinforced Plastics Division here.

Heat-resistant epoxy resin compositions are reinforced with steel, aluminum, or combinations of steel and glass fibers, then pressure-formed into shaped castings, according to Bakelite's A P Mazzucchelli.

The resulting castings have impact strengths, heat-distortion points and thermal conductivities "greatly in excess of conventionally reinforced, room-temperature epoxy compositions." And, Mr Mazzucchelli said, the metal fibers give such castings a high degree of machinability, plus heat control to a degree that the castings can be made in practically any size.

"To obtain best performance when applying these compositions to tools and dies," Mr Mazzucchelli said, "a special technique was developed which consists of flocking or spraying a face coat of short metal fibers on the pattern or mold used for fabricating the reinforced casting. Either glass or metal fibers then may be used for the body of the casting."

Three Die Compositions

Laboratory tests and field trials have shown that three compositions are suitable for making metal forming dies and other tools:

- A mass casting, based on a heat-resistant epoxy resin reinforced with low-carbon steel fibers of continuous or varying lengths, and surfaced with a face coat based on epoxy resin and steel-fiber flocking.
- A mass casting based on a heat-resistant epoxy resin reinforced with glass fiber, and surfaced with a face coat based on epoxy resin and a steel-fiber flocking.
- A mass casting based on a heat-resistant epoxy resin reinforced with aluminum fibers, and surfaced with a face coat based on epoxy resin and aluminum-fiber flocking. (This composition was developed for applications requiring high thermal conductivity, such as precision metal casting molds, slush molding dies.

In addition to improving tool performance, metal fibers flocked into face coatings prevent the coatings from sagging on corners and vertical walls of molds.

"The use of metal or glass fibers as a reinforcing material reduces the problems of shrinkage and brittleness experienced with most heat-resistant systems and extends their maximum continuous operating temperatures to at least 350 F," Mr Mazzucchelli said.

Compositions of this type can be used in more-rugged applications, such as metal forming dies for medium production runs. They can be machined easily, can be heated by induction or resistance and, when steel fiber is used, can be magnetized. Too, these compositions permit easy retention and support of dowels, screws, and steel cutting edges. Dies made with these compositions can be repaired, when necessary, by plugging techniques.

Because these compositions result in a homogeneous tool or die, the danger of bond-line rupture (which frequently occurs between the metal core and resin face coat of conventional plastic dies) is eliminated.

"One of the most important characteristics of these compositions," according to Mr Mazzucchelli, "is their mass castability without sacrifice of toughness and other physical properties. Although epoxy resin systems highly filled with metal powder can be cast in large sizes, they are relatively weak mechanically and shrink excessively.

"The use of metal or glass fiber reinforcement with pressure casting avoids the excessive peak exotherms, and concomitant high shrinkage and internal strains normally encountered with metal-powder fillers. The steel-fiber composition has a thermal conductivity 10 times greater than an unfilled heat-resistant epoxy resin. The aluminum-fiber reinforced composition has a thermal conductivity 60 times greater than an unfilled epoxy and 15 times greater than one with aluminum powder."

Mr Mazzucchelli also reported that tests have shown that physical properties of these compositions are affected by variation in fiber length, with these properties improving as length of fiber is increased.

However, as fiber length decreases, homogeneity and easier handling are gained. For mass casting, ¾ to 2-in. fibers have been found to be the desirable range for best balance of properties. Metal fibers, about ¼ in. long, are used in flocking the face coat. They do not appear to degrade properties seriously, maintaining triple the modulus and about double the impact strength of the unfilled resin.

Casting pressures of 200 to 300 psi generally are used when fabricating a steel-fiber reinforced tool, while pressures of 50 to 100 psi are used for the glass-fiber reinforced composition faced with steel-fiber flocking.

When metal fibers are used, the average fiber content is about 55 to 60% for steel, and 45 to 50% for aluminum, by weight. If glass fibers are used for reinforcement, the average fiber content is 50%. Castings are post-cured up to 300 F for several hours, depending on size.

More than 70 technical papers covering developments in the reinforced plastics industry were presented during the conference.

Plastics Up 20% in '57

During the conference it was announced that a recent market study shows 168-million lb of reinforced plastics were sold during 1957, a 20% increase over 1956.

Industry forecast for 1958 is hazy, because reinforced plastics are making their greatest current gains in fields closely tied to the general business economy. But a 15% to 20% gain is expected this year.

Reinforced plastics usage in the aircraft and missile fields includes components for rocket motors, fins, and radomes. It has been predicted that these materials will make up as much as 85% of the airframe weight of future missiles, particularly as a heat shield for metals. Today, reinforced plastics are being tested at temperatures as high as 14,500 F.

Reinforced plastic is the only structural material that has been reduced in price, according to Clare E Bacon of Owens-Corning Fiberglas Co. Most commonly used materials in reinforced plastics are polyester resin (45¢ per lb in 1949, 35¢ in 1957) and fibrous glass mat (60¢ per lb in 1949, 50¢ in 1957).

Washington talks it over with industry–are there

Enough Jigs and Fixtures for War?

WASHINGTON—America's capacity to manufacture jigs and fixtures would have to be doubled in the event of war to an annual output of $295 million worth (peak 1955 output: $118 million). Not only that, it was brought out during a recent meeting of the Jig and Fixtures Task Group with Business & Defense Services Administration, the industry's product mix will differ widely from what it is today.

The trend in jigs and fixtures will be toward smaller and more accurate products, BDSA's J J Coen told the group. Where tolerances are now spoken of in thousandths, he said, the electronics and missile industries are even now getting into millionths. Stacking fixtures, for instance, will have to be "on the button," Mr Coen said.

And this will affect the kind of help required and the number of hours worked. Critical in this respect is production of both small jigs and fixtures and extra-large assembly fixtures.

Can Shops Switch Products?

Industry representatives in general agreed that shops now making small (under 500 lb) jigs and fixtures could, if necessary, switch over to manufacture of larger items without much difficulty, or vice versa. But it was generally agreed, too, that the quantity and quality of workers available in the industry in time of mobilization would be the predominant factor as to whether a given shop could change its pattern of production successfully.

For instance, a die shop could easily convert to manufacture of jigs and fixtures. But a jig and fixture maker might have a good deal of trouble in changing over to production of dies.

Gaging a Potential Problem

Because of the current trend toward closer and closer tolerances, members of the Task Group feel that gaging and measuring might give the industry some trouble in the event of a war step-up. Experience in World War II and Korea indicate that this country needs a good supply of optical gaging instruments. In those wars, comparators, toolmakers' microscopes and other forms of stereoscopic microscopes were in such short supply that critical work was often delayed.

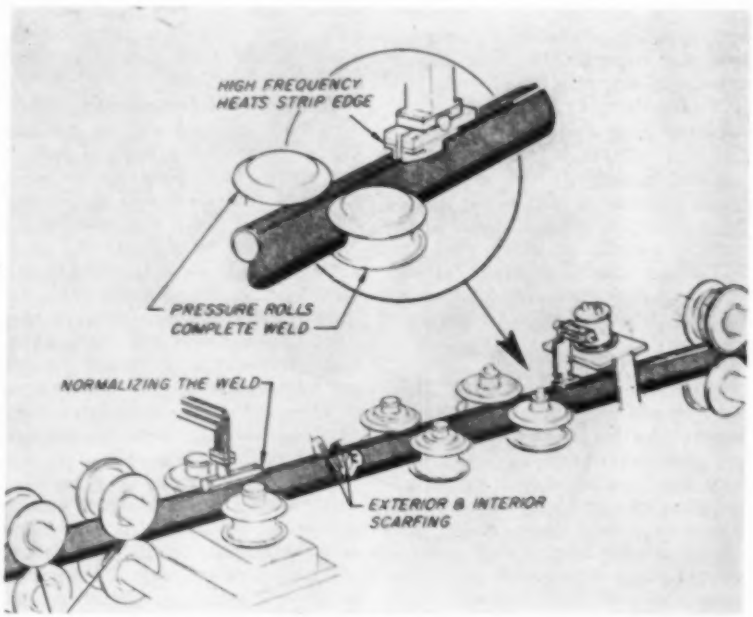
Conditions of gaging, industry people felt, would have to be standardized because, for example, a 10-ft-long piece of ordinary tool steel would vary 1/1000 in. with every 1° change in the atmosphere in which inspection takes place. And, said one Task Group member, present materials aren't up to today's needed close tolerances.

Skilled Manpower is Critical

Most critical problem facing the jig and fixture industry, it was agreed, is retention and development of skilled manpower. Too, because of a slackoff in business in recent years, even the number of manufacturers is dwindling steadily. Jig and fixture maker training is also woefully inadequate.

M-Day Production Reshuffle

In the event of mobilization, BDSA Metalworking Equipment Division Director Niels A Olsen said, orders could and would be issued to stop levels of production in such areas as automobiles and appliances, and tool and die facilities redispersed into critical fields of defense. In the event of mobilization, the four critical factors in programming an industry will be (1) stabilization orders, (2) manpower orders, (3) material orders, and (4) production orders.



Pipe welding at 450,000 cps

Bead-less welded steel pipe of high strength and quality is being produced by Southern Pipe & Casing Co, Azusa, Calif, with a high-frequency resistance welding process installed in a continuous pipe mill. Process, which can weld ferrous, nonferrous or alloy tubing, involves carrying current to the weld area with two sliding contacts, one on each side of the seam, just inches from the point of weld. Tube reaches the welder in an open-seam condition. When strip edges reach welding temperature, pressure rolls force them together to form a forged-type weld—450,000 cps is used. Current travels through very shallow depth of metal, confining resistance heating to abutting surface areas. After interior and exterior welding and scarfing of flash metal, tube is normalized by a 10 kc induction head. Pipe is now produced at a rate of 20,000 ft per day in 4½ to 8⅝ in. OD, with wall thicknesses from 14 gage to 3/16 in., in lengths up to 50 ft

At long last, the unions agree on

Who Builds What in Your Plant

WASHINGTON—Labor leaders are calling a truce in their long and bitter rivalries over jobs and bargaining rights in the nation's industrial plants.

The first break in the historic internal battles that split the AFL and CIO 20 years ago, and have kept the feud simmering even within the two-year-old merged Federation, came last week. At the mid-winter conference of the AFL-CIO Executive Council in Miami Beach, rival unions came to terms on new anti-raiding plans and an agreement to end jurisdictional wars between craft and industrial unions.

For the employer, it means a gradual lessening of the strife between unions over the right to perform construction work in the nation's factories; it diminishes the raiding between craft and industrial unions in conflict. Too, the boycott weapon used by one union against another is being dulled.

Surprised the Unions, Too

The new union harmony came suddenly, when AFL and CIO union officials anticipated another fruitless round of conferences over internal federation strife. But, to their surprise, they discovered a series of circumstances had brought about an atmosphere for the first real craft-industrial truce.

A combination of a slackened economy, which is making the job situation tough enough, without losing more jobs because of union strife, helped to bring about an agreement. In addition, new personalities have risen to the top of the AFL-CIO Building Trades Group, making it more amenable to negotiations with Walter Reuther's Industrial Union Department.

Essentially, these are the peace plans negotiators for both sides drew up at the Miami Beach conferences:

- The Building Trades and Industrial Union departments finally settled, after many attempts, on a plan that can lead to solutions of their ancient battle over the rights to plant construction work. Both sides figure the plan has the elements to at least eliminate jurisdictional feuding.
- The AFL-CIO Executive Council tightened its anti-boycott provisions by putting violating unions through an investigation process that could end in a clamp-down by the powerful Executive Council on the guilty union.
- An extension of the no-raid pact to those unions, such as the Sheet Metal Workers, which had refused to sign the formal agreement. This means that all raiding cases will go before an impartial umpire for solution, although the non-signing unions aren't committed to the binding decision of the umpires. The Executive Council would get those cases.

All the labor troubles in these areas won't suddenly end. But the agreements provide processes that could eventually end them, and certainly should begin to slow down such conflicts.

For instance, the IUD-Building Trades pact spells out the construction job rights in industrial plants. Under the agreement terms, all new construction is to go to the Building Trades unions; all production and running maintenance work to the Industrial unions. The in-between area in conflict—major repairs, relocation of machinery, additions to buildings and so on—is to be settled in the plant where the rival unions meet in conflict.

Two-man union teams of investigators are to be assigned to each jurisdictional dispute, and make a recommended award to one side or the other. If these terms are rejected, the dispute will end up in the hands of the Executive Council, with eventual arbitration seen as the final solution, but not part of the present pact.

Such jurisdictional disputes are not uncommon, and have been the basis for the AFL-CIO's internal troubles over the past two years. The Federation merger failed to solve the problems and even threatened to split the organization down the middle. Now, however, the rivals have a working program which AFL-CIO President George Meany claims "gives us more unity now than anyone could have envisioned three years ago."

Tieing in the no-raiding act to non-volunteers is another clamp on the union affiliates of the AFL-CIO. It now is but a short step to make a binding no-raiding pact on all AFL-CIO unions, whether they choose it or not.

The boycott ban is another move in the same direction. The AFL-CIO constitution outlaws an attack by one AFL-CIO union on another, but use of the boycott now becomes a specific act for investigation by an impartial umpire who picks out the violator.

Family Battles

The Executive Council had two examples of dispute cases to solve as the first tests of its new rules during the Miami Beach meetings.

One was a lingering 12-year dispute involving the Burt Mfg Co of Ohio and two battling unions, the United Steelworkers and the Sheet Metal Workers Union. Steelworkers' President David J McDonald and the Burt Co, too, have frequently protested that the Sheet Metal Union is boycotting ventilator products of the Ohio company.

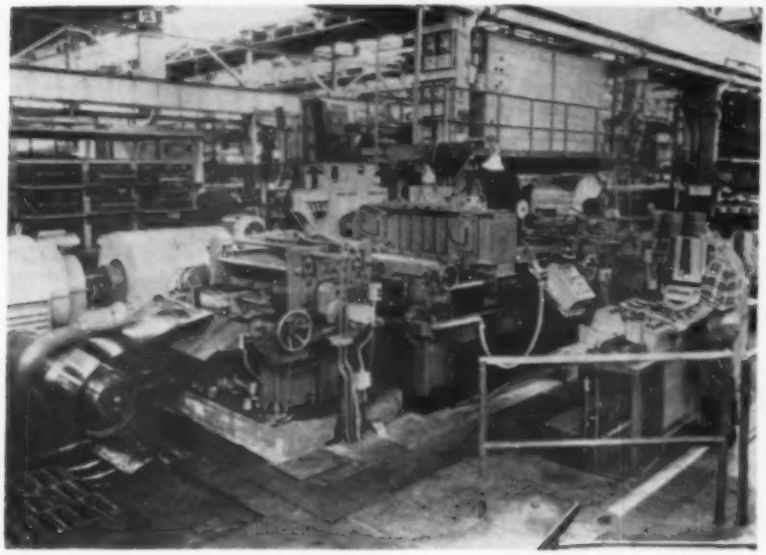
In previous actions, the Executive Council has ordered the Sheet Metalworkers to end their boycott, despite their protests that Burt is their rightful territory. But the case was brought back by McDonald on the argument that it's far from settled.

Another union dispute—this one concerning raiding—was brought to the ruling Executive Council of AFL-CIO vice presidents by the United Auto Workers' Walter Reuther. Reuther claimed the Metal Trades Department of AFL-CIO has been trying to wrest bargaining rights from his members at The Martin Co's Denver plant. The Council ordered the Metal Trades Union in that territory to cease and desist.

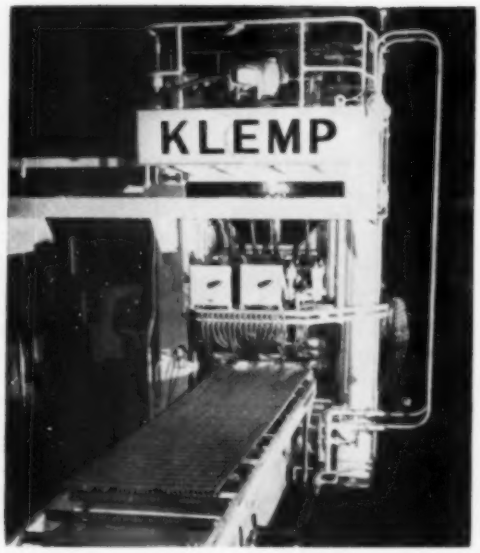
While AFL-CIO unions were drawing up peace plans, they also worked out an unofficial truce with the now-independent Teamsters Union expelled from the Federation last December.

While the Teamsters expulsion is to be continued, according to AFL-CIO President Meany, as long as James R Hoffa stays at the head of the trucking union, apparently the split won't be carried on to the plant and shop level. Both sides are willing to go on as before, with the division only at headquarters.

FIELD REPORT...



For coil splicing . . .



For metal gratings . . .

Automatic welders go to work

Details on two automatic welders have just been released. One, at the Rome, N Y, plant of Revere Copper & Brass, splices copper coils (above left). The other, at Klemp Metal Grating Corp, Chicago, is used in fabricating metal grating (above right). The Revere unit, built by E W Bliss, handles 99%-pure copper coils in a fraction of the time needed for hand welding. Machine accepts rolls up to 37.5 in. wide before trimming. Tail end of lead coil is centered, clamped and sheared, then end is swung up out of the way and lead end of next coil is done the same way. Shear and welding clamp assembly moves into welding position, and machine builds one 6000-ft coil out of three 2000 footers. The Klemp machine is shop-built on a gib-guided 125-ton Verson hydraulic press, supplied with four resistance welding transformers, totaling 1200 kva, and eight point tap switch heat regulators. To this has been added controls and a special hydraulic indexing unit that assures positive cross-bar spacing. Machine welds gratings up to 36 ft long, 36 in. wide—in an 8-hr shift produces about 3500 sq ft of grating

MIDWEST...

Sundstrand Machine Tool Co, Rockford, Ill, has entered the guided missile field through purchase of **American Machine & Foundry's Turbo Division,** Pacoima, Calif. Turbo, which designs and develops accessory power supplies for missiles including the AF Atlas ICBM and the Navy Sparrow II, will be integrated with Sundstrand's aircraft component plant at Denver to form a new **Sundstrand-Turbo Div.** Both facilities will continue to operate at their present locations . . . **Clark Equipment Co,** Buchanan, Mich, is reported to be negotiating for acquisition of **Brown Trailers, Inc,** Spokane, Wash. Brown, with plants at Spokane, Reading, Penna, and Galesburg, Ill, has had annual sales totals of more than $12 million in recent years . . . AF contract for $1.6 million has gone to the aircraft equipment department of **Westinghouse Electric's** small motor division in Lima, Ohio. Order calls for undisclosed number of 40-kva ac generators for B-52G bombers . . . **Lithium Corp of America,** Minneapolis, and **Brooks & Perkins,** Detroit, have established a working agreement under which both companies will participate jointly in research on new lithium-containing metal alloys. **B&P,** most recently engaged in the development and fabrication of the Project Vanguard satellite, will continue its work on lithium-magnesium systems, both independently and in conjunction with Lithium Corp . . . **Pullman-Standard Car Mfg Co** has a contract for fabrication of the world's first all-welded aluminum highway bridge. Job will be done at the Chicago works plant . . . **Hoover Tool & Die Co** has opened its new 63,000-sq-ft plant in Centerline, Mich, just northeast of Detroit. Firm began operations in a two-car garage 20 years ago . . . **Chrysler** will close down its Youngstown stamping plant by spring, retain presses on a standby basis. Company recently completed a large stamping plant at Twinsburg, about 40 miles from Youngstown . . . First of three large electric furnaces of the **Ohio Ferro-Alloys Corp's** new reduction plant at Powhatan Point, Ohio, is in operation. It'll produce silicon metal for the aluminum and chemical industries in the Ohio Valley . . . **Seren Machine Products,** Chicago manufacturer of jigs, fixtures, valves, assemblies, is starting construction of a 40,000-sq-ft plant in Schiller Park.

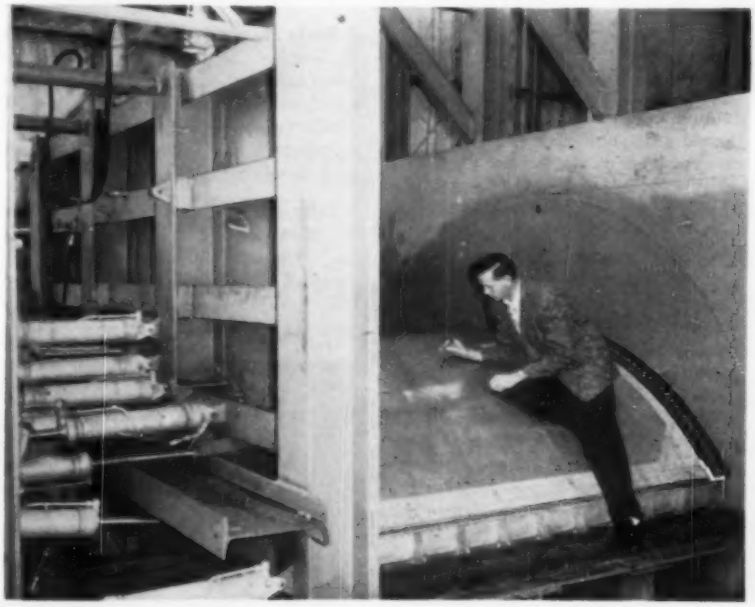
SOUTH...

Hayes Aircraft Corp, Birmingham, has a new subcontract from Chrysler to manufacture missile parts and launching equipment for the Jupiter long-range missile . . . **Edgcomb Steel Co,** Philadelphia, plans to set up a $1.5 million metal service center in Greensboro, NC . . . **Sunray**

Chairs, Inc, Miami maker of webbed aluminum furniture, is building a new $1 million plant with 125,000 sq ft of production space . . . **General Electric's** big maintenance and repair facility will be in operation in Miami by mid-April. It'll service electrical apparatus for industry throughout south Florida . . . **Roberts Co,** Sanford, NC, producer of textile spinning machinery, has set up a complete plastics division to make parts for its machines. Company also designs and builds its own molding presses . . . **Douglas Aircraft's** Charlotte, NC, plant is now involved in production of the Hercules missile . . . **Combustion Engineering,** Chattanooga, Tenn, is building reactor vessels for Navy's first nuclear-powered guided-missile cruiser. Each unit, weighing 125 tons, is designed to withstand pressures up to 2500 psi . . . **American Air Filter Co,** Louisville, Ky, has enlarged its product line through acquisition of **Kennard Corp,** St Louis manufacturer of heating and cooling coils, and heating, ventilating, and cooling units . . . **Lockheed** is prepared to initiate production of the Jetstar at its Georgia Div subject to AF approval after evaluation testing. The 600-mph jet utility trainer-transport can be turned out in seven proposed military versions . . . **Shell Chemical Corp** plans to build two multi-million plants at Norco, La, within the next few months . . . **Sperry-Farragut Co** has begun installation of machinery in its new plant at Bristol, Tenn, for production of missile systems equipment . . . Navy has supplied a new engine for flight testing in the TT-1 jet trainer being manufactured at **Temco's** Dallas plant. Plane was originally equipped with a 920-lb thrust unit, new one is a 1025-lb job . . . A quarter-million-dollar electronic computer has been installed in **Lockheed's** Marietta, Ga, plant to analyze complex stress and flutter problems formerly ironed out in wind tunnel tests. When the unit arrived it was discovered to be 2 ft higher than the engineering-center doorway.

WEST . . .

Aerojet-General Corp expects to add 1000 professional and skilled workers to the payroll at its Sacramento, Calif, plants by June. Company currently employs about 7000 in the Sacramento facilities where work is in progress on rocket power plants for the AF Titan ICBM, the Navy Polaris IRBM, and others . . . New $11.4 million AF contract brings scheduled production of **Lockheed** T-33 jet trainers to over the 5600 mark. Order is the 15th successive military purchase for the T-33, and will extend work at the Burbank, Calif, plant into late 1959 . . . **Telecomputing Corp,** Los Angeles, has a $2.4 million Army contract for data reduction services at the White Sands Proving Grounds in Alamagordo, NM. Included in the order, which runs through 1958, is $668,000 worth of new test equipment which in the past has been turned out by **Telecomputing's Data Instruments Div** in North Hollywood, Calif . . . **Siegler Corp** is establishing a combined research, development, and production center scheduled to become the nation's largest in the field of heavy roll forming of new metals. Center will be located at the company's **Hufford Div** main plant in El Segundo, Calif, where contract work in stretch forming and other special machine tool services is currently being done for production runs of any extent. Work is now underway on the center's first Spin-Forge machine, similar to Hufford's initial unit developed specifically for producing ram jet engine parts for ground-to-air missiles . . . **North American Aviation** has a $2.6 million AF order to develop an airborne flight control system that uses a thrust reverser and permits automatic instrument landings by high-speed aircraft . . . **Food Machinery & Chemical Corp,** San Jose, Calif, has a $51.5 million contract for production of amphibious M59 armored personnel carriers developed by **FMC.** Order, largest so far for the M59, came from Army's San Francisco Ordnance District . . . Expansion of operations of **Oregon Metallurgical Corp,** Albany, Ore, producer of ingots and castings of zirconium, titanium, and other rare metals, will follow a $1 million increase in the firm's capitalization. It's currently working on a $4 million contract to supply zirconium ingot to **Westinghouse Electric** . . . **Sperry Phoenix Co** has purchased 3400 acres as site of a future plant near Phoenix, Ariz. Reports are that firm plans to base a guided missile testing system on the acreage . . . **Voi-Shan Manufac-**



Skin test at Convair . . .

This is the way Convair San Diego measures the growth rate of a crack induced in a test fuselage section for its 880 transport. A four-inch saw cut is made in the 0.10-in. aluminum alloy skin, and a 22,000 psi longitudinal pull is applied. Then hydraulic rams move the plate in the foreground and internal air and water pressure are applied, generating a total longitudinal pull of 350,000 lb. Even after the fissure lengthened to 20 in., there was no failure of the structure, and major crack growth could be obtained only after prolonged cycling of alternate pressure and release of pressure

turing Co will put up a $3 million plant in Canoga Park, Calif. Company's present operations (bolts, screws, nuts) in various parts of Culver City will be consolidated in the new 132,000-sq-ft facility.

EAST . . .

Sun Shipbuilding & Drydock Co, Chester, Penna, and **New York Shipbuilding Corp,** Camden, NJ, have contracts to build four (two each) 10,000-ton deadweight cargo ships at an estimated cost of $45 million . . . **Radio Corp of America** will be over-all contractor for design and production of super-radar detection systems planned by the Air Force. **GE** and **Western Electric** will also engage in the project, estimated to cost $721 million. Most of the **RCA** phase of the work will be done at facilities in Moorestown, NJ . . . Two manufacturing divisions of **American Chain & Cable Co,** the **Allison** (abrasive wheels) and the **Campbell Machine** (abrasive cutting machines) have been merged. New unit is called the **Allison-Campbell Div** . . . **Kurt Orban Co,** Jersey City, NJ, has been named exclusive distributor in the US and Canada for rolling mills made by J Banning, AG, of Hamm, Western Germany. **Orban** will also handle installation and servicing . . . **Kidd Drawn Steel Co,** Aliquippa, Penna, has been taken over by **H K Porter Co.** Company, which makes drill rod and other special shapes, will be combined with Porter's Vulcan Crucible Steel Div, basic producer of carbon, alloy, and high-speed tool steels . . . **Penn-Texas** has sold **Crescent Co,** Pawtucket, RI, subsidiary which makes insulated wire and cable. Transaction, for $1.1 million, marks the fifth **P-T** subsidiary to be sold in recent months . . . **Waterbury Manufacturing Co,** division of **Chase Brass & Copper,** is terminating operations. **Chase** expects to concentrate exclusively on brass and copper mill products . . . **Lewis-Shepard Products** has added 75,000 sq ft of floor space to its Watertown, Mass, facilities for making fork lift trucks and related materials handling equipment. Production area now totals 300,000 sq ft . . . **LeCount Tool Works** has moved into its new plant at 38 Cody St, West Hartford, Conn . . . **Westinghouse Electric** is putting up a new building for the manufacturing and repair division on a 2½-acre site near Utica, NY.

Carter L Burgess has been elected president of American Machine & Foundry Co. He was formerly president of Trans World Airlines

George A Kendall, chief engineer of Wickes Corp's Machine Tool Div, Saginaw, Mich, has been appointed divisional president and general manager

Joseph H Cadieux, formerly vice president of Misco Precision Casting Co, Whitehall, Mich, has been named vice president of Casting Engineers Incorporated, Chicago.

Howard H Deem has been appointed director of manufacturing for both Valvair Corp and Sinclair-Collins Valve Co. Prior to joining the organization, Mr Deem served as supervisor of the plant and manufacturing engineering section of Ford Motor Co's Cleveland foundry.

J Early Hardesty, treasurer of Black & Decker Manufacturing Co, has been elected, in addition, a vice president of the firm. **George W McCarty,** chief engineer, has been appointed vice president, research and development.

I John Billera has been elected senior vice president of US Industries, Inc. He was previously vice president and treasurer. **James J Hoffer,** director of marketing, has been appointed vice president, marketing.

J V McGuire has been named assistant general manager of Allis-Chalmers Pittsburgh Works. Formerly manager of the switchgear department, he is succeeded by **D W Webb** who has been manager of sales, switchgear assemblies and unit substations. **H P Pinkham** has been promoted from assistant to the general manager of the Boston Works to assistant general manager there.

Marion W Klippel has been appointed eastern regional sales manager for the National Automatic Tool Co. Mr Klippel, who has been serving as field engineer working out of the Detroit office, succeeds **John R Keates,** recently appointed general sales manager.

Walter L Flinn has been named staff director, defense activities, for Vickers Inc. He has been serving as manager of the Vickers Aero Hydraulics Division office in Washington where he will continue to make his headquarters.

Spencer B Booz (left), former president of Federal Machinery Sales Co, has been designated president of the newly formed Federal-Bryant Machinery Co. (*AM*—Feb 10, p147). **Charles B Tansley,** formerly president of Bryant Machinery & Engineering Co, is vice president of the new organization, and sales manager of its machine tool department

CARL M BEACH

ROBERT C BEVIS

LAWRENCE H COUSINEAU

NAMES IN THE NEWS...

Carl M Beach has been appointed general manager of the Heald Machine Co, Worcester, Mass, subsidiary of the Cincinnati Milling Machine Co. A mechanical engineering graduate of the University of Cincinnati, he has been with Cincinnati Milling continuously since his co-op student days. He has been a sales engineer, Detroit district sales manager, assistant sales manager and, since 1951, domestic sales manager. Since 1953 he also has been vice president and a director of Cincinnati Milling and Grinding Machines, Inc. **Robert C Bevis** will succeed Mr Beach as sales manager of the Cincinnati Milling Machine Co. Aside from three years in naval service during the war, he has been with the company since engineering student days at the University of Cincinnati. Since October 1956 he has been assistant sales manager. **Lawrence H Cousineau,** vice president and assistant general manager of the Heald Machine Co, will serve also as a vice president of the Cincinnati Milling Machine Co. He is a graduate of the Bentley School and is a certified public accountant. He joined Heald in 1946 as assistant treasurer, became head of the financial division in 1952, and vice president, sales, a year later. When Cincinnati Milling acquired Heald in 1955, he assumed his present duties at Heald.

William J Bryant has been elected chairman of the board and **J Hartness Beardsley,** president of the Bryant Chucking Grinder Co, Springfield, Vt, which recently became a subsidiary of Ex-Cell-O Corp, Detroit. Mr Bryant formerly was president and Mr Beardsley executive vice president. **Richard W Bowlen** will continue as first vice president, **Alan E Stubbs** as vice president and sales manager—machine tools, and **Harold A Bush** as treasurer. Mr Bowlen also has been elected chief financial officer. Elected to the board of directors, along with Mr Bryant and Mr Beardsley were **H Glenn Bixby, James K Fulks, Earl E Conlin** and **Donald H McIver** of Ex-Cell-O. Bryant will continue to retain its name and to operate under Springfield management.

Frank G Fisher, formerly vice president and general manager of Rheem Automotive Co, Fullerton, Calif, has been appointed president and general manager of the Atkins Saw Division of Borg-Warner Corp, Indianapolis. He succeeds **S J Roush,** group vice president of B-W, who has served as divisional president since 1952.

Guy H Pitts, manager of Bohn Aluminum & Brass Corp's Fabrication Division, has been elected vice president, manufacturing.

Harry G Hilk has joined Clearing Machine Corp as general superintendent of the Chicago Plant

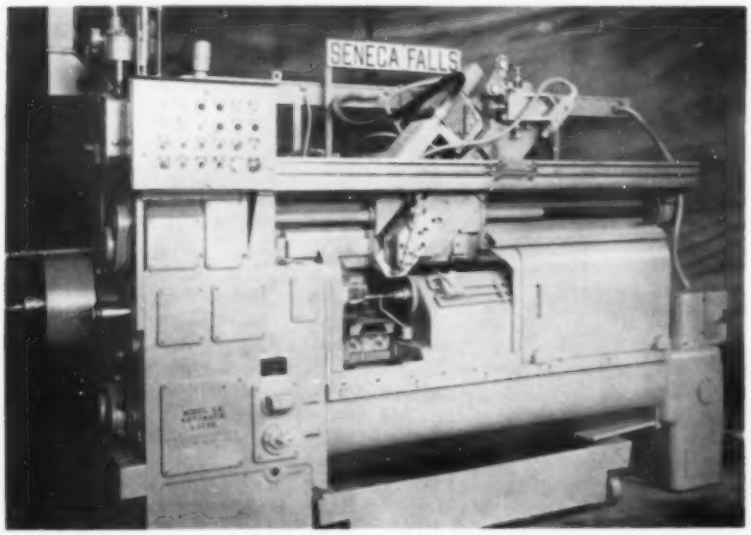
Walter Kassebohm has been appointed general manager of Marchant Calculators, Inc, Oakland, Calif. Formerly executive vice president, operations, Mr Kassebohm is now the company's chief executive officer and holds the title of executive vice president and general manager. He takes over the duties of **Edgar B Jessup** who has retired as president and general manager, and is now serving as board chairman.

Ernest M Riggleman has taken over the duties of vice president and division manager of American Bosch Arma Mississippi Corp. He was formerly vice president and division manager of Chicago Division, American Bosch Arma Corp.

Bertrand D Marshall has retired as regional manufacturing plant manager in charge of Chevrolet plants in Detroit, Buffalo, and Tonawanda, NY. **William L Mosher, Jr,** regional plant manager in charge of manufacturing plants at Livonia, Mich, Toledo and Cleveland, Ohio, and Muncie and Indianapolis, Ind, succeeds Mr Marshall as head of operations at Detroit Gear & Axle, Detroit Forge, Tonawanda Motor, Foundry and Forge, and Buffalo Axle.

Robert A Slater has been appointed manager of manufacturing engineering in the Metallurgical Products Dept of General Electric Co in Detroit. He was formerly senior manufacturing engineer in the Schenectady headquarters. **Robert B Kurtz** has been appointed manager of manufacturing for the General Purpose Control Dept at Bloomington, Ill. Formerly manager, manufacturing engineering, he suceeds **F C Fisher.**

New Shop Equipment



Automatic Tracer Lathes Combine Rough and Finish Operations

Completely automatic tracer lathes, Models LQ and AQ, combine the advantages of multiple tooling for rapid stock removal and single tool tracer turning for accurate finishing operations. Operator simply loads shaft between centers and pushes starting button. The multiple tools turn, then retract, after which the tracer tool finish turns and retracts to the starting position, and machine is ready for reloading.

Multiple tools mounted on a rear carriage do the roughing; finish turning is done with single, tracer controlled tool on one or more overhead carriages. This permits close tolerances because the pressure of the tracer controlled tool is constant over the entire length of the workpiece and allows full advantage of the higher cutting speeds now possible with carbide and oxide tool materials. Lathes may be equipped with automatic loading and transfer units.

Carriages are available in five combinations: overhead left hand tracer carriage tracing from headstock toward tailstock and a right hand tracer from tailstock to headstock; right hand tracer and multiple tool carriage; two right hand tracers and two multiple tool carriages; two right hand tracers and two squaring or necking carriages; or left hand tracer and left hand multiple tool carriage.

Tool adjustment is reported to be extremely rapid. Diameter and shoulder length accuracy is controlled by the stylus, which is adjusted by means of compound slides operating in conjunction with two dial gages for diameter and shoulder length. Convenient control stops permit synchronization of all longitudinal and cross feed movements, as well as the rapid traverse of carriages and cross-slides.

Other features include simplified changeover for reduced setup time; feed rate that can be changed during cutting cycle; screw feed to all carriages; four-speed head with automatic changeover; and open front design.

Specifications for Model LQ lathes include 20-in. swing over bed; 14-in. (max) swing over rear and overhead slides; and height of spindle center from floor of 39 in. Lathes are available with capacity between centers of 26, 38, 50, 74, 98 and 110 in. Max carriage travel is the full length of bed. Spindle speeds range from 120 to 2500 rpm. Feed rates range from 0.0045 to 0.045 ipr; rapid traverse rate is 300 ipm. Model AQ lathes have 22-in. swing over bed; 16-in. (max) swing over rear and overhead slides; and height of spindle center from floor of 41 in. Lathes are available with capacity between centers of 26, 54, 68, 82, and 110 in. Max carriage travel is the full length of bed. Spindle speeds range from 89 to 1280 rpm. Feed rates range from 0.006 to 0.060 ipr; rapid traverse rate is 200 ipm. Bulletin available.

Seneca Falls Machine Co, Seneca Falls, NY

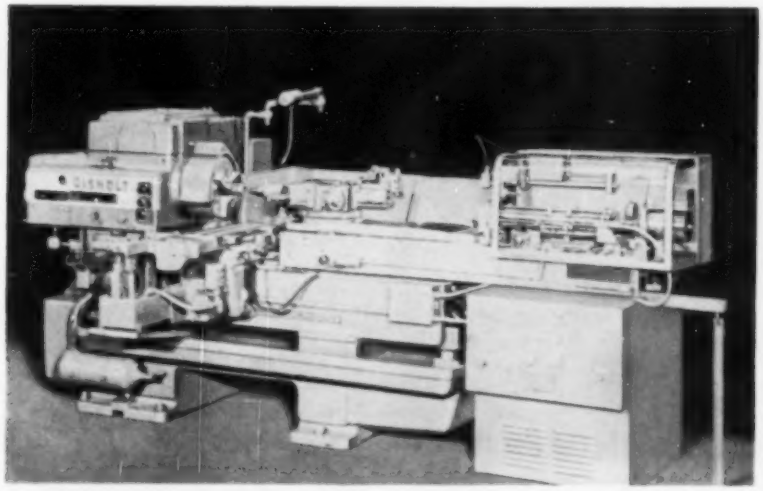
Swivel Gage Speeds Setup Of Landis Cylindrical Grinders

Device called Micro-Swivel is designed for quick and accurate setting of the swivel table on new Landis precision cylindrical grinders. It is an amplification unit that greatly magnifies table movements which are registered on a large, easily read gage.

As an operational example, a test grind on a straight workpiece may indicate that it is 0.0002 in. small in an 8-in. length measured toward the footstock end of the machine. Operator turns the knobs to neutralize the detectors at each end of the table, sets selector switches for the 8-in. length and tenth scale, and adjusts the gage to show 0.0002-in. correction on both ends of swivel table. Table clamps are released, and regular swivel table adjusting screw turned so that the needle returns to zero. This zero check can be made by both the headstock and footstock ends by turning a selector knob.

Landis Tool Co, Waynesboro, Penna

Materials and Parts



Hydraulic Drive Automates Gisholt Hand-Operated Turret Lathes

With the application of the Lynn Hydraulic Drive (Lynn Mfg Co, Minneapolis, Minn) to the turret carriage and the Hydro-Slide to the cross-slide carriage, the Gisholt Masterline ram-type turret lathe becomes completely automatic in all its functions. The full range of spindle speeds from 30 to 1500 rpm (40 to 2000 rpm optional) is available with any turret station, and an infinitely adjustable power feed range may be had for both the turret and the front and rear cross-slide tools.

Tooling follows standard turret lathe practice and uses common turret lathe tools. The Lynn drive provides for spindle start, stop and reverse; selection of any spindle speed for each turret face; rapid tool approach; desired feed rate; controlled dwell, back feed or immediate fast return and index at end of cut; independent automatic operation of the cross-slide in either direction; operation of the collet chuck and/or bar feed; control of indexing chucks and fixtures; and operation of swinging stock stops, mechanical loaders.

The Hydro-Slide, a completely independent unit in all its functions, has an available motion of 10¼ in. with an infinite feed range for either transverse direction. Both front and rear cross-slides have identical rapid traverse, feed dwell and reverse, and the cross-slide automatically returns to a neutral position when not in use.

The Recipromatic, an optional accessory, is designed to clear accumulated chips, when drilling deep holes. The drill is rapidly traversed to the cutting position, fed into the work for the specified interval and then rapidly backed out to clear the chips. It is then rapidly traversed to the point where it stopped cutting and shifted into feed for continuing cut. This action can be repeated automatically at any desired frequency until the desired depth is reached. The action is then cancelled out of the cycle and the turret rapid traverses back and indexes to the next station. Bulletin 1182-A available.

Gisholt Machine Co, Madison 10, Wis

Brazing Stop-Off Material Acts as Parting Compound

Nicrobraz material, designated White Stop-Off, acts as a parting compound to prevent the brazing of not-to-be-brazed mating surfaces during furnace brazing operations. Supplied as a powder, it is mixed with a volatile plastic, called Nicrobraz Cement, to facilitate application .

Wall Colmonoy Corp, Stainless Processing Div, 19345 John R St, Detroit 3, Mich

including...

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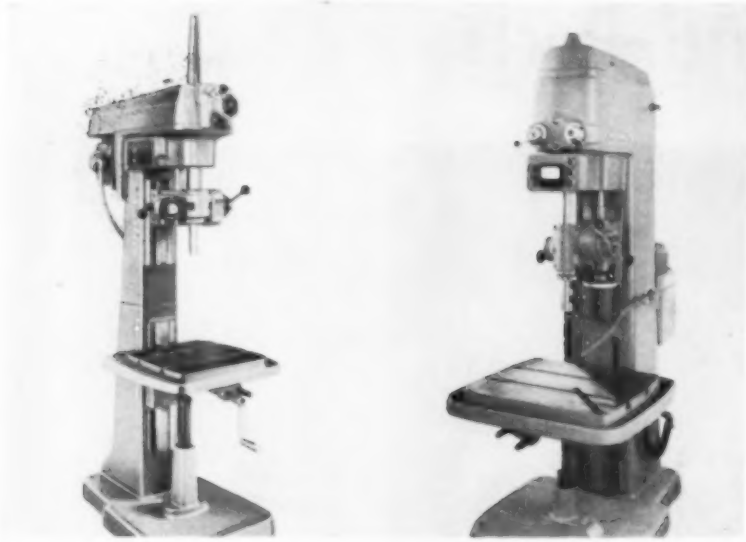


Cincinnati Sliding Head Drills Offer Infinitely Adjustable Speeds

Infinitely adjustable spindle speeds and rapid change of speeds are the outstanding features of these new Infispeed drilling machines. All controls are located on front of the machines.

Medium-duty models (left), available in 16 and 24-in. sizes, have a 1-in. drilling capacity in cast iron. They are built in single and multiple spindle, floor, bench and production box-column models. Spindle speeds range from 450 to 3000 rpm with a standard 1800-rpm 1-hp motor. Power feed is optional on the medium-duty machines.

The heavy-duty models (right), available in 21 and 25-in. sizes, have 1½-in. drilling capacity and are made in box and round column, single and multiple spindle floor models. They provide spindle speeds of 60 to 1825 rpm with the standard 1800-rpm 3-hp motor. Power feed with five feed rates from 0.002 to 0.015 in. is standard equipment on the heavy-duty models.

Speed selection is accomplished through a variable speed pulley. On medium-duty models, the engaging diameter of the pulley is varied by a handwheel on the face of the drill head. On the heavy-duty machines, it is varied by a fractional-hp motor controlled by a "slow-fast" turn-button switch. The heavy-duty units also have a back geared drive to provide max torque at all speeds.

All Infispeed models have a tachometer mounted on the head to aid in accurate speed selection. Positive stop is standard equipment on all models.

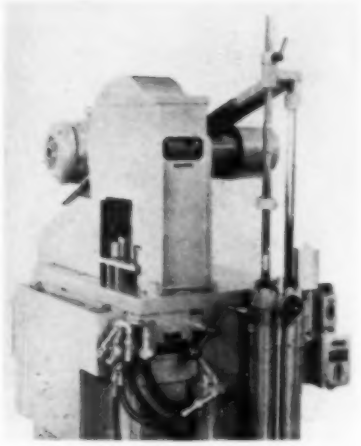
Cincinnati Lathe and Tool Co, Cincinnati 9, Ohio

Portable Tools Feature Noiseless Exhaust, No Loss in Power

New series of portable power tools features noiseless, blastless exhaust. Initial models now available include light-duty and medium-duty drills, screwdrivers and tappers. The exhaust air is routed back through a system roughly parallel to the inlet system, and escapes at a point adjacent to the air inlet. A porous bronze diffuser located at the outlet deadens any remaining exhaust noise and dissipates the escaping air evenly in all directions. Grain porosity allows air to escape freely without back pressure or noise. There is no loss in power.

As optional equipment, the company furnishes an exhaust deflector which replaces the diffuser and is of the same size. It is equivalent to the diffuser in noise elimination, and can be turned in any direction. The diffuser may also be replaced by a standard air hose, for the purpose of venting exhaust air at a point well removed from the operator.

Aro Equipment Corp, Bryan, Ohio



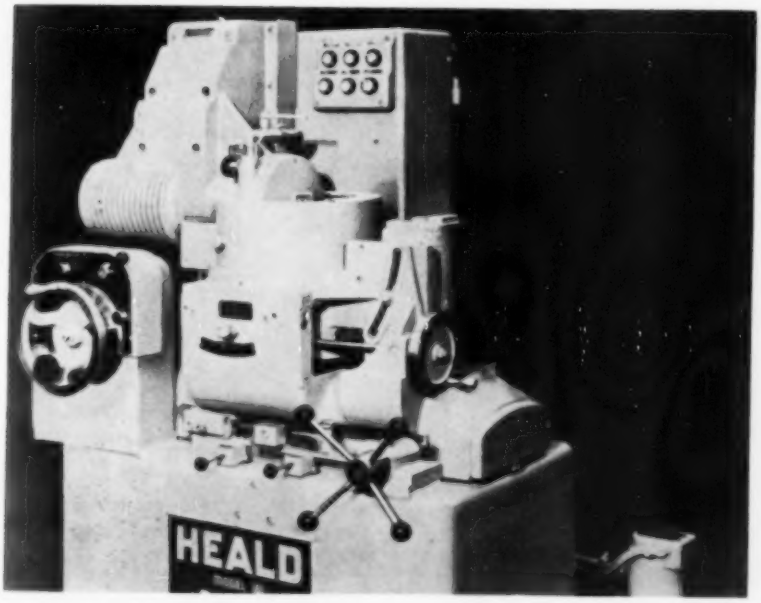
Oscillating Dry-Abrasive Cutter Cuts Steel up to 4 in. Square

Equipped with a heavy-duty 10-hp, 3600-rpm motor to provide a spindle speed of 2450 rpm, this Model 28 Sever-All unit has the capacity to handle solid steel up to 4 in. square, 6-in. angles, 8-in. channels and 4-in.-OD pipe or tubing at 90° to axis. It also cuts brass, bronze, monel, aluminum, or any other hard materials.

Both portable and stationary models are available. Basically, the machine is an oscillating type unit in which the abrasive cutting wheel and workpieces are manually fed by the operator. The wheel is lowered into the work by a hand lever. With oscillation, the amount of abrasive wheel contact is reduced and cutting is performed with a minimum of wheel pressure and without burn at a rate of 2 to 5 sec per sq in. A double-acting workholder automatically positions the material; material is clamped at both sides of wheel.

As an optional feature machine can be equipped with power wheel feed, power oscillation and air-operated work clamps. The machine measures 56 x 32 x 62 in. high. It can be equipped with 18 or 20-in. abrasive wheels.

American Chain & Cable Co, Inc, Allison-Campbell Div, Bridgeport 2, Conn



Heald Rotary Surface Grinder Handles Workpieces up to 6 in. OD

Designed for small work grinding operations on a high production or job-lot basis, the Model 161 rotary surface grinder grinds flat, convex or concave surfaces of work up to 6 in. OD. The column-type machine, which can produce finishes of 2 to 4 mu-in. in suitable types of material in routine operations, accommodates a wide range of relatively small work such as saw blades, slitters, gear cutters, and similar parts.

Machine features hydraulic control of the operating cycle. Hydraulic table feed rates are infinitely adjustable from 0 to 10 fpm to permit smooth, slow dressing speed and instant change to rapid traverse or reciprocating speed. Model is also available as a manually operated machine which can be changed over to hydraulic operation by adding a power pack.

The 6-in. magnetic chuck can be swiveled 15° for grinding convex or concave surfaces. Machine has a 10-in. vertical capacity to center of wheel, 4-in. grinding stroke and 12½-in. swing inside the guard. Provision is made for wet grinding operations.

A dial-type feed box permits incremental vertical feeds of 0.0001 in. from 0 to 0.0006 in. for rough grinding, changing automatically to 0.0001-in. fine feed at any point from 0 to 0.005 in. before finish size.

Wheelhead drive motor is built into end of the wheelhead spindle to eliminate belt drive and provide more power for heavy stock removal. Other features include welded steel base, cradle-type chuck bracket and swivel adjustment that minimizes chatter, and a vibration-free diamond which gives the wheel a smoother dress. Machine occupies floor space of only slightly over 2x3 ft and can be installed in a total projected floor area, including door swing, of less than 4x5 ft.

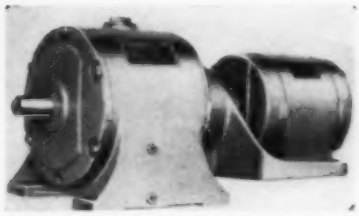
Heald Machine Co, Worcester 6, Mass

Oven Stress Relieves Tools and Relieves Hydrogen Embrittlement

Two-chamber oven is used for relief of hydrogen embrittlement in plated parts and stress relieving and normalizing of tool, springs, etc. Electric heating is employed (gas heating available). Each chamber operates independently. The upper chamber has 15-kw input heat capacity, max operating temperature of 1000 F, and is equipped with a 720-cfm recirculating blower. The lower chamber has 6-kw heat input capacity, max operating temperature of 650 F, and is equipped with a 400-cfm recirculating blower.

Work space of both chambers is 24 x 24 x 18 in. high. The control panel has individual indicating and excess-temperature controls.

Grieve-Hendry Co, Inc, 1401 W Carroll Ave, Chicago 7, Ill



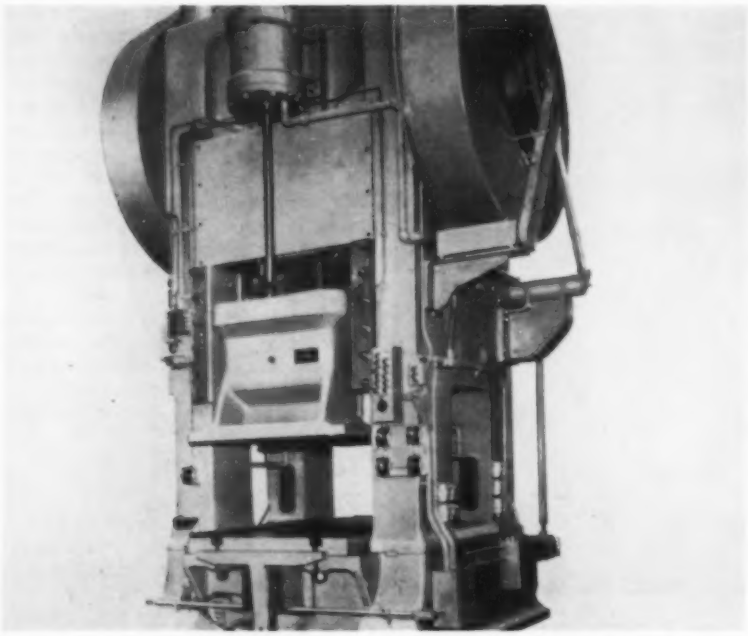
STRAIGHTLINE GEARMOTORS, both integral and all-motor, are available in ranges from 1 to 60 hp, from 9 to 520 rpm. Features detailed in bulletin 5806 requested on company letterhead—*Western Gear Corp, PO Box 182, Lynwood, Calif*

Semi-Automatic Feed Device Increases Swaging Machine Output

Universal air-draulic feed for swaging machines is reported to increase production, provide more uniform shapes, lower the reject rate, and reduce operator fatigue. The feed unit eliminates hand holding of the workpiece during swaging operations.

Operator positions the workpiece on a chuck, and from automatic clamping to finished swaging and table return, the feed is automatic. A cam on the feed table contacts a limit switch to shift into rapid traverse. As workpiece advances into swager's pilot bushing, a second feed rate is established by a second limit switch. The feed rate cycle is similarly controlled throughout the swaging operation, with controlled length of dwell at end of stroke. Feed table automatically returns at rapid traverse and unclamps the workpiece.

Abbey-Etna Machine Co, Perrysburg, Ohio



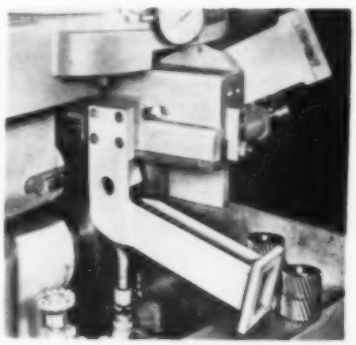
Bliss Double Knuckle Joint Press Features Large, 48 x 84-in. Bed

Model K2 mechanical press, reported to be the first of its kind, is designed to permit multiple coining and the coining of large size or widely separated parts. Double knuckle arrangement, one in front and one in back, produces uniform two-point ram pressure for heavy tonnage operations on a 48 x 84-in. bed.

The 1000-ton capacity unit is supplied with a 9-station front-to-back transfer feed on 9-in. centers. Feed bar centers are adjustable right to left, and provision is made for two feed lines using four bars for coining small parts. Knuckle assemblies break inward toward each other and are actuated by links from a slide mounted between them. Knuckle suspensions are rigidly mounted on the crown. Adjusting wedges and the adjusting mechanism for the ram are built into the ram, stroke of which is 8 in., with motorized adjustment of ½ in.

Press is of straight side design, four-piece steel tierod construction. It is single geared with twin end drive. Additional features are Bliss Type K clutch and brake arranged so lining inserts can be changed rapidly without removing clutch from shaft; air-operated flywheel brake and a recirculating oil lubricating system. Low pressure cascade-type lubrication is supplied to each knuckle assembly; high pressure system lubricates other points in the press drive mechanism.

E W Bliss Co, Press Div, Canton, Ohio



Automatic Loading and Unloading Device Speeds Gear Finishing

Designed for automated lines, this automatic loading and unloading device can be ordered as original equipment or as a modification unit for all 870-series finishers now in use.

With gears automatically fed from a demand-type parts-distribution system, the device permits one operator to handle a battery of machines. Loading, shaving and unloading are all automatic. The loading unit, although custom tailored to the application, is standardized for gears up to approx 4-in. dia. As an optional feature, the unit can be equipped with gaging gears (a work-sizing fixture) at the entry end of the feed chute.

In operation, gears roll down a gravity chute. A pneumatic-cylinder-operated plunger then places part into the loading shuttle, which carries the gear to the shaving position where the gear is picked up by air-operated centers or plug-type locators. If gear does not mesh properly with cutter, a sensing device prevents centers from entering the part. In this case the shuttle returns and repeats operation. After finishing, the centers withdraw and the shuttle returns the gear to the "out" position. A plunger then moves gear from the shuttle into the ejection chute and places next gear into the shuttle.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

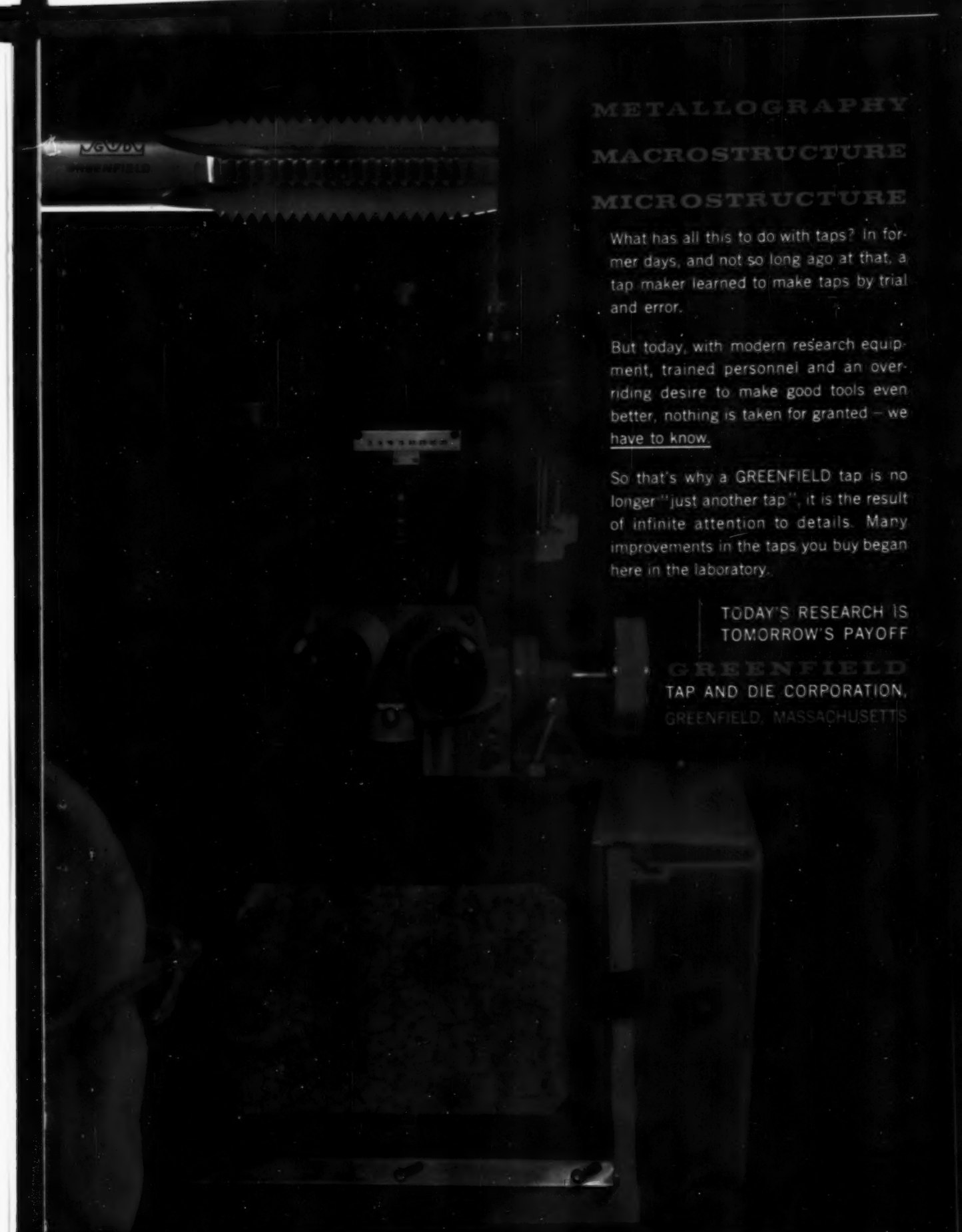
Daco Miniature Gear Heads Adapt to Standard Mark 7 Motors

Miniature precision gear head, reported to be suited for use in control systems, indicating devices, computers, and servos, is adaptable to standard Mark 7 motors. It is 1.437 in. in dia and 1.093 in. long. Ratios from 15:1 to 4300:1 are obtainable.

Unit is capable of handling loads up to 50 oz-in. and momentary loads to 100 oz-in. Mounting the gear head to motor is simplified by an adapter ring.

Gears are completely enclosed. Backlash is held to 30 min of arc, with a 5 oz-in. reversing load. Axial play is limited to 0.003 in. with a load of 1 lb applied to output shaft. Radial play is not greater than 0.002 in. per in. of length with a 4 oz-in. load. Special units can be made with slip clutches, special shafts and any required ratio.

Daco Instrument Co, Tillary & Prince Sts, Brooklyn 1, NY



METALLOGRAPHY

MACROSTRUCTURE

MICROSTRUCTURE

What has all this to do with taps? In former days, and not so long ago at that, a tap maker learned to make taps by trial and error.

But today, with modern research equipment, trained personnel and an overriding desire to make good tools even better, nothing is taken for granted – we have to know.

So that's why a GREENFIELD tap is no longer "just another tap", it is the result of infinite attention to details. Many improvements in the taps you buy began here in the laboratory.

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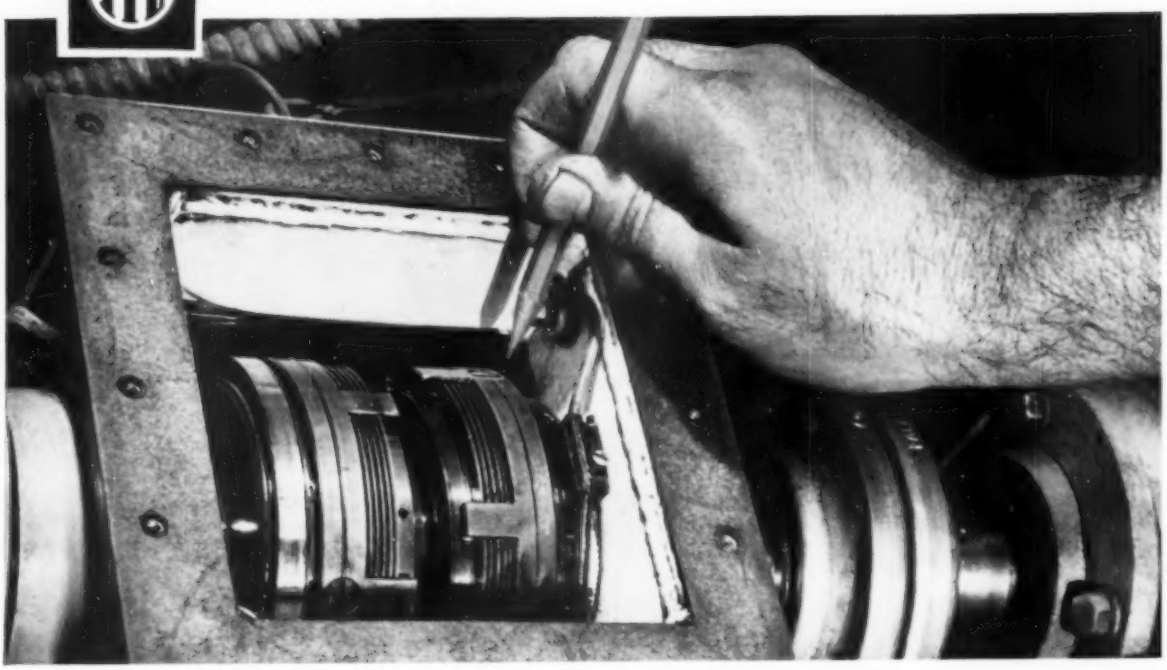
ELECTRO-CLUTCHES



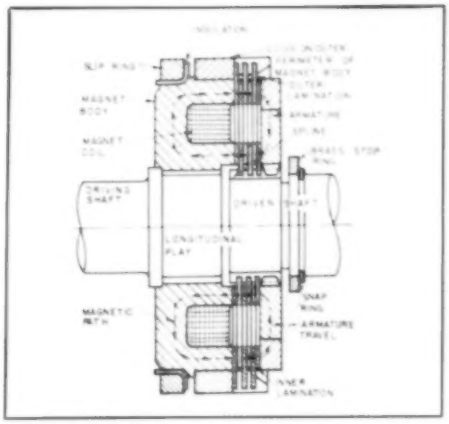
NO ADJUSTING

Get instant speed and feed changes for your machines without need for periodic checking and adjusting of clutches or gradual loss of torque. This is how: insist on genuine I-T-E Electro-Clutches.

No air gap. The patented closed magnetic circuit passing directly through the laminations provides tremendous torque in small space without need for maintaining precision air gaps. So the I-T-E Electro-Clutch goes right on giving uniform, troublefree clutching year in and year out.

More for your money. I-T-E Electro-Clutches are designed to operate in an oil bath. They can go right into your transmission box—often without altering dimensions. All-steel laminations outlast other clutch metals, plastics and friction discs—thus insuring longer clutch life. Safe 24 v operation permits use of telephone type relays, proved for dependability.

Select the exact clutch type you need from a wide range of stock models. For complete information, write I-T-E Circuit Breaker Company, Transformer & Rectifier Division, 19th & Hamilton Sts., Philadelphia 30, Pa.



Principle of operation. Alternate laminations key with perimeter lugs and splined shaft respectively. Rotate freely until magnet coil is energized. Magnetic flux attracts the armature, compressing the laminations with great force, engaging clutch.

I-T-E Electro-Clutches are already in use by these leading companies:

Bullard Fosdick Sundstrand
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I-T-E CIRCUIT BREAKER COMPANY
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MACHINES AND ATTACHMENTS

1 GEAR PRODUCTION EQUIPMENT —*National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich.* 24-page illustrated catalog AP57-11 gives general capacity table and descriptions of rotary shaving machines for internal and external spur and helical gears up to 200-in. capacity. Broaching tool section covers broaches, broach heat treatment facilities, broaching fixtures and automatic loaders for broaching machines.

2 HEAVY-DUTY BLANKING PRESS —*Minster Machine Co, Minster, Ohio.* 4-page bulletin describes 40E-0, a 400-ton capacity model for blanking heavy material up to ½-in. thick. Includes specifications and dimensions as well as standard and optional equipment.

3 PRECISION GRINDING MACHINES—*Arter Grinding Machine Co, 47 Sagamore Rd, Worcester 5, Mass.* 8-page illustrated bulletin gives data on four models of rotary surface grinders in chuck sizes from 8 to 40 in.; one model of a cylindrical-internal grinder, and the new Jigmatic tape-controlled positioning table.

● ABRASIVE BELT GRINDING — *Engelberg-Huller Co, 321 W. Fayette St, Syracuse, N.Y.* 24-page booklet contains 30 illustrated case histories including production figures, type of belts used, belt life, fixturing, comparison with prior or alternative methods; stock removal, tolerance, and finish specifications. Variety of machine models described for range of applications. Request direct on company letterhead.

4 NUMERICALLY CONTROLLED INDEX TABLE—*Modern Engineering Service Co, 1695 Twelve Mile Rd, Berkley, Mich.* 4-page illustrated bulletin describes point-to-point positioning Jacy precision digital index table featuring infinite resolution from 1 to 21,600 minutes of arc. Solid mechanical lock with zero backlash automatically engages in all index positions permitting repetitive accuracy to within 1 sec of arc.

5 HYDRAULICS AND LUBRICATION MANUAL—*Snyder Tool & Engineering Co, 3400 E Lafayette Ave, Detroit 7, Mich.* 20-page illustrated brochure contains instructions for general hydraulic and lubrication system maintenance for automated special machine tools, together with discussion of lubricants and lubrication chart.

6 FOOT SQUARING SHEARS—*Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, N.Y.* 12-page bulletin 80-FC illustrates and describes design and operating features of Series F and Series G (with gap) for light sheet metalworking. Cutting lengths and capacities of all models given in specification page.

TOOLS AND ACCESSORIES

● CERAMIC INSERTS — *Vascoloy-Ramet Corp, 800 Market St, Waukegan, Ill.* 4-page bulletin 5710 describes advantages of cutting operations with VR-97 inserts for negative rake toolholders. Ceramic VR-97 triangular and square throw-away inserts are capable of speeds of 2000 sfpm and up, with feed to 0.020 in., and cuts to ⅝-in. depth. Properties and specifications given, plus application data on use for cutting chilled cast iron, 6150 aircraft steel, extruded graphite electrodes, and 4140 steel. Request direct on company letterhead.

7 ELECTRONIC GAGE FOR GRINDERS—*Landis Tool Co, Waynesboro, Penna.* 4-page bulletin MS-57 describes Micro-Swivel attachment, an electronic amplification unit that enables operator to set the swivel table quickly and accurately to extremely close limits on new Landis grinders. Device can also be used as a gage for checking work diameters.

8 DIESET ACCESSORIES — *K W Bliss Co, 1400 Brookpark Rd, Cleveland 9, Ohio.* 8-page illustrated catalog 70-A describes full line of die supplies available. Includes specifications and prices on hard steel drills, transfer screws, layout fluid, die rubber, oilers, hex head cap screws, various types of screws and bolts.

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9 GRANITE SURFACE PLATES — *Collins Microflat Co, 3249 W El Segundo Blvd, Hawthorne, Calif.* 64-page illustrated technical manual describes Microflat black granite surface plates (lapped down to 50-millionths over-all accuracy) and precision inspection accessories.

10 COMPONENTS FOR JIGS AND FIXTURES—*Northwestern Tool & Engineering Co, 114 Hollier Ave, Dayton 3, Ohio.* 16-page illustrated catalog 28 covers over 400 components and over 200 clamping items. Scale size tracing templet of the jig and fixture components is included.

11 ELECTRONIC COMPARATOR — *Threadwell Tap & Die Co, Greenfield, Mass.* 8-page illustrated folder gives data on new S I unit. Operational details, description of features, specifications of instrument for on-the-job gaging to 0.00002 in.

● ULTRASONIC TEST TECHNIQUES —*Sperry Products, Inc, Shelter Rock Rd, Danbury, Conn.* 12-page bulletin 50-107 contains illustrated information on ultrasonic testing services and equipment. Discusses applications of inspection methods to quality control, production testing, and preventive maintenance. Request direct on company letterhead.

PLANT SERVICE EQUIPMENT

12 "SIMPLE METHODS FOR ANALYZING PLATING SOLUTIONS" —*Hanson-Van Winkle-Munning Co, Matawan, NJ.* 36-page booklet discusses analytical principles, use of apparatus, and methods for sampling a plating solution. Outlines in detail the necessary steps involved in 28 analytical methods for testing nickel, copper, silver, and other metal-working solutions. Includes equipment description, electromechanical data, conversion tables.

13 AIRLESS BLAST CLEANING MACHINES—*Wheelabrator Corp, 1140 S Byrkit St, Mishawaka, Ind.* 32-page illustrated catalog 961-D covers entire line, as well as wet blast, air blast, and dust control equipment. Also included are cast steel shot and grit abrasives, sandcutters, and core rod straighteners.

14 HEAT FANS—*General Blower Co, Morton Grove, Ill.* 20-page bulletin HF 100 contains facts on Dura-Temp line of high-temp units for elevated temperatures. Features and construction components pictured and discussed. Engineering data in tables and charts.

15 FIRE DETECTING-EXTINGUISHING EQUIPMENT—*Walter Kidde & Co (Dept A), Main St, Belleville 9, NJ.* 12-page catalog P-40 describes and illustrates portable extinguishers, built-in carbon dioxide fire extinguishing systems, smoke detecting and rate-of-rise fire detecting systems.

16 DUST CONTROL—*W W Sly Manufacturing Co, 4650 Train Ave, Cleveland 1, Ohio.* 36-page catalog 104 gives details on dust filters, dust control systems and how to engineer them. Operating principles, capacities and dimensions. Engineering section outlines step-by-step procedure that can be followed in determining type and size of hooding, piping, and dust filter. Tables aid component selection.

PARTS AND MATERIALS

17 FASTENERS—*Abbott Screw & Bolt Co, 1725 W Walnut St, Chicago 12, Ill.* 40-page catalog lists thousands of fasteners carried in stock. Illustrates and describes manufacturing processes and facilities.

18 PACKAGED SPEED CONTROL DRIVES—*Clark Controller Co, 1146 E 152nd St, Cleveland 10, Ohio.* 8-page bulletin 20,000 describes drives for equipment requiring adjustable speed or speed synchronization. Explains basic circuit and many modifications available including speed regulation, constant-potential dc supply, dynamic braking, and acceleration control. Features, applications, specifications included.

19 "DUCTILE IRON DIGEST"—*International Nickel Co, Reader Service Section, 67 Wall St, New York 5, NY.* 18-page illustrated booklet describes new metal with tensile strength up to 200,000 psi, as much as 30% elongation. Charpy impact values range from 15-115. 24 case records show how strength and toughness can be cast in tiny levers and huge engine frames.

20 FLEXIBLE COUPLINGS — *T B Wood's Son's Co, Chambersburg, Penna.* 8-page bulletin 10100 contains data on Sure-Flex couplings designed to withstand all combinations of misalignment and end float and to absorb up to 15° of torsional shock. Five tables shortcut usual engineering calculations. Units are adaptable to more than 150 different service applications.

21 MACHINERY MOUNTING MATERIAL—*Korfund Co, 45-39B 32nd Place, Long Island City 1, NY.* Bulletin VC-501 provides information on Armstrong's Vibracork, a vibration, shock, and noise controlling material recommended for massive, difficult-to-isolate machinery. Available in two densities and three thicknesses for wide variety of loading requirements. Standard sheet size is 12 x 36 in.

22 HYDRAULIC VALVES — *Rivett, Inc, Brighton 35, Boston, Mass.* 12-page catalog Section 210 on manually operated, 4-way units describes pipe-connected, flange-connected, and sub-plate mounted models operated by lever, cam, or foot. Available in 7 basic spool designs and 8 sizes from ¼ to 2 in., rated at 2000 and 3000 psi.

23 CLUTCHES FOR PRESS CONVERSIONS—*Minster Machine Co, Minster, Ohio.* 16-page bulletin CC57 illustrates and describes combination air friction clutch and brake. Advantages outlined; operational details discussed; typical installations pictured and described.

24 "BALL BEARING YIELD AND SYSTEM ISOELASTICITY" — *Barden Corp, Danbury, Conn.* 12-page booklet offers comprehensive background data on radial and axial play, axial takeup and preloading, as well as isoelastic bearings and achievement of system isoelasticity.

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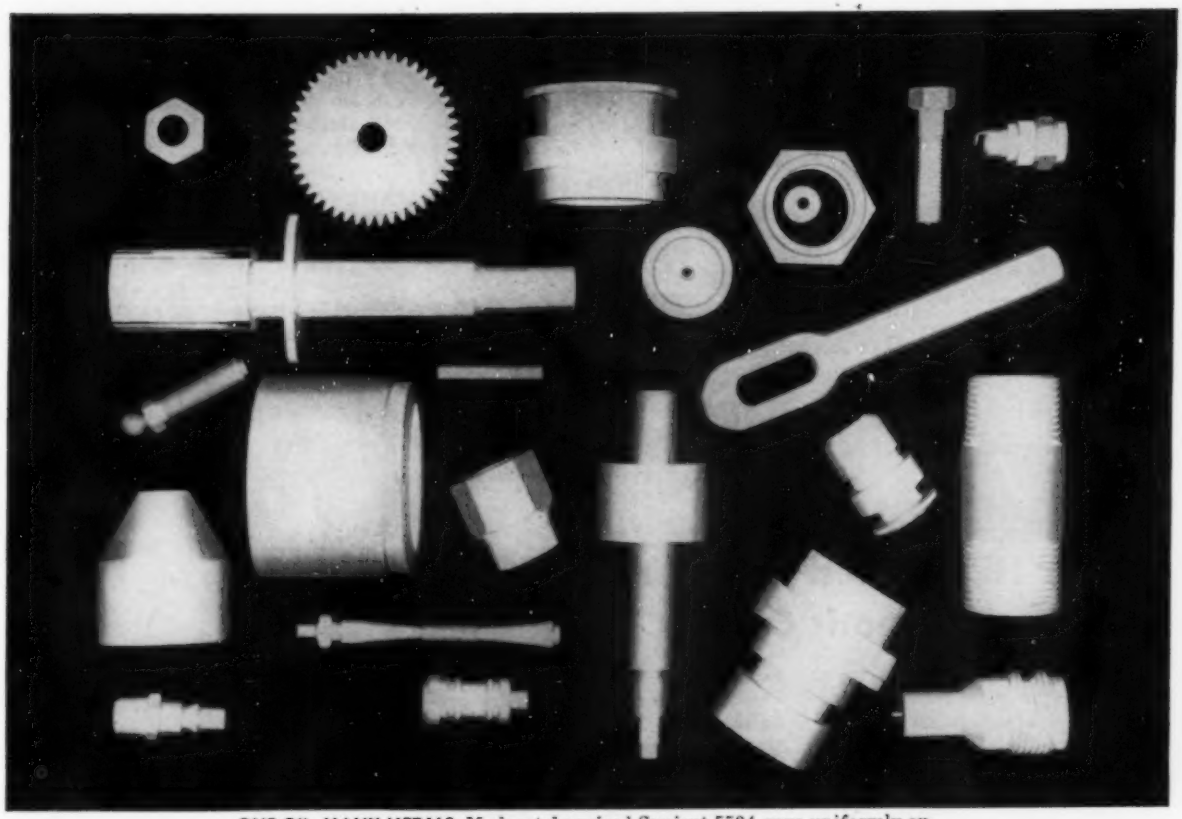

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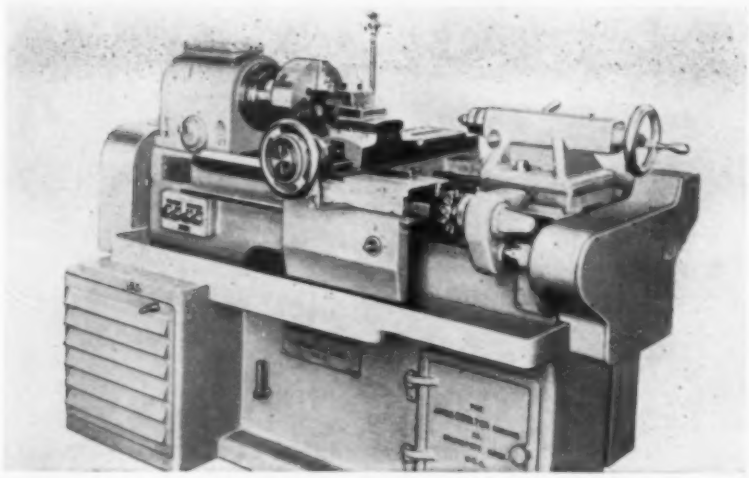


Coulter High Speed Threading Lathe Features Automatic Cycle

Model B single point, high speed threading lathe is an automatic, mechanically operated model capable of producing internal threaded pieces of up to 10 in. in dia and external pieces up to 6 in. in dia. The machine measures 80 x 36 x 40 in. and is equipped with a 3-hp motor. It has a 24-in. capacity between centers with a max swing of 6 in. across the cross-slide and 14 in. over the bed. The spindle speeds are infinitely variable in the ranges of 250-1000, 150-600, 125-490, with special speeds if necessary.

Among the special features of the machine are a skip feed mechanism for producing multi-start threads of 2, 3, 4, 6, 8 and 12; a conveniently located control to permit easy maneuvering of the carriage positioning; and an infinite speed control for changing spindle speeds. Other features include quick changeovers, worm-gear drive to spindle, live center in tailstock, and a motor-driven coolant pump.

James Coulter Machine Co, 136 James St, Bridgeport, Conn

Paste-Type Solder Alloy Automates Soldering Process

Series CW, developed primarily for use in a completely new, automatic soldering process, incorporates special binders and fluxes together with finely divided pure solder alloys to form a stable paste. Material is certified to be non-hardening and non-separating.

Paste can be automatically or semi-automatically applied to the part prior to soldering through special dispensers located in the production line. Incorporation of latest automatic heating devices in the line help to make the process completely automatic.

Fusion Engineering Co, 17921 Rosedland Ave, Cleveland 12, Ohio

High-Speed Machine Locates and Drills Holes in Templets

High-speed Coordinator machine locates and drills holes in templets to within 0.002 in. The machine can also be used for making drill jigs, simple fixtures and other precision work in flat sheet metal or plate. It is particularly suited for templets up to 36 x 42 in. for the company's turret punchpresses and other equipment. Hole sizes range from 1/16 to ⅜ in.

Material is placed against end stop and secured to a cross-slide by work positioning clamps. Using a simple X-Y chart for hole locations, the operator sets the dimensions with two optical scanners in conjunction with fixed scales. Hole is drilled from the bottom through a carbide drill bushing. Any number of holes of uniform size can be located and drilled in rapid sequence. There is no cumulative error because all dimenisons are from a zero reference point to X and Y coordinates.

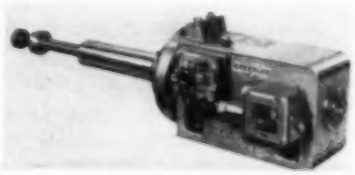
Wiedemann Machine Co, Hicks Coordinator Div, Wissahickon Ave, Philadelphia 32, Penna

Small Electro-Magnetic Drillpress Drills Holes up to ⅜ in. Dia

Bantamsize, lightweight portable drillpress called Mighty-Midget has been added to company's line of electro-magnetic drillpresses. Weighing only 20 lb and measuring only 9¼ in. high, tool can operate in close quarters and in hard-to-reach locations inaccessible to larger portable drillpresses.

Particularly adaptable for use on tool setup work, dies, jigs and fixtures, special machinery, plumbing and electrical jobs, maintenance and repair work, it will drill up to ⅜-in. and tap 5/16-in. holes.

Portomag, Inc, 1511 East Nine Mile Rd, Ferndale 20, Mich



New, Compact Hydro-Borer Model Has 5-in.-per-min Feed Capacity

Model S-7, for boring large assemblies or small individual pieces, is 34½ in. long, 7¾ in. high, 5½ in. wide. Spindle diameter is 1¾ in. with No. 3 Morse taper. Length of

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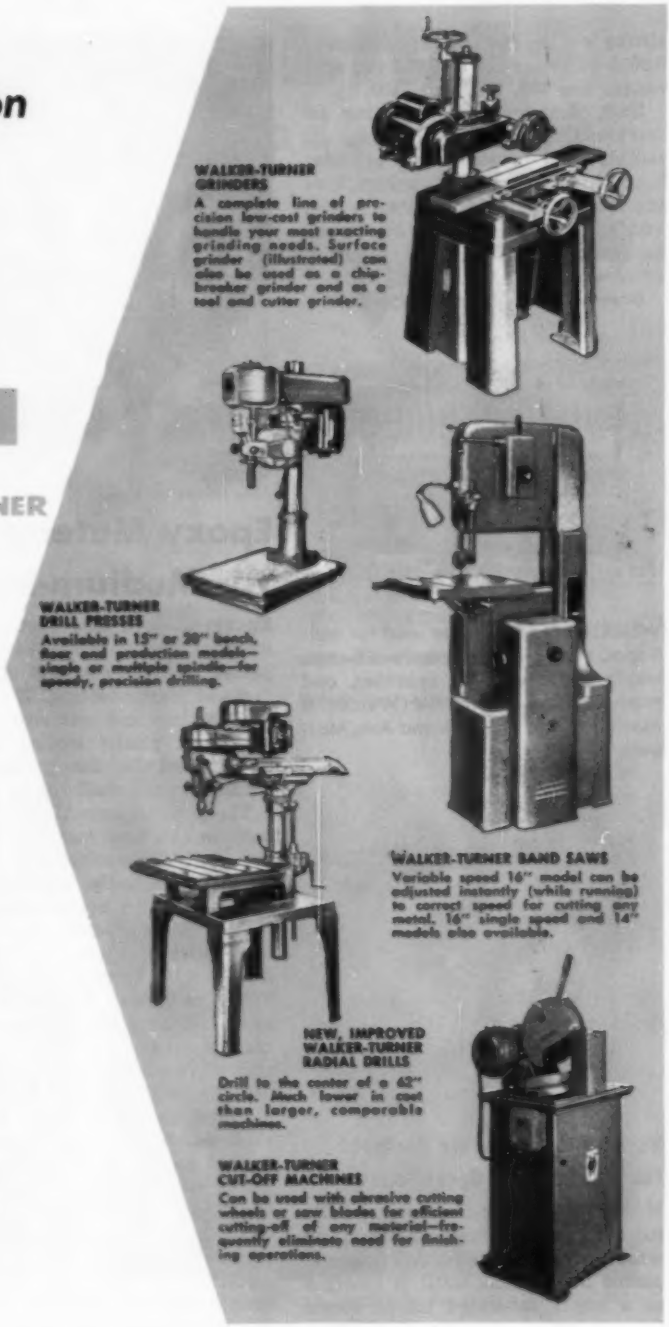
With Walker-Turner "Light-Heavyweight" Machine Tools, you get the precision features of larger, far more costly equipment. In addition, you get the advantages of versatility and portability that make your operations more flexible and more economical. That's why portable W-T tools are replacing fixed, heavier machinery, with substantial savings in initial investment and maintenance costs.

It will pay you to check today on the many ways W-T "Light-Heavyweights" can save time and money in your plant.



WALKER-TURNER GRINDERS
A complete line of precision low-cost grinders to handle your most exacting grinding needs. Surface grinder (illustrated) can also be used as a chip-breaker grinder and as a tool and cutter grinder.

WALKER-TURNER DRILL PRESSES
Available in 15" or 20" bench, floor and production models—single or multiple spindle—for speedy, precision drilling.

WALKER-TURNER BAND SAWS
Variable speed 16" model can be adjusted instantly (while running) to correct speed for cutting any metal. 16" single speed and 14" models also available.

NEW, IMPROVED WALKER-TURNER RADIAL DRILLS
Drill to the center of a 62" circle. Much lower in cost than larger, comparable machines.

WALKER-TURNER CUT-OFF MACHINES
Can be used with abrasive cutting wheels or saw blades for efficient cutting-off of any material—frequently eliminate need for finishing operations.

For a demonstration, call your W-T distributor (He's listed under "Tools" in your yellow pages)... or

MAIL COUPON FOR COMPLETE DETAILS!

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WALKER-TURNER
Division of Rockwell Manufacturing Co.
Dept. WB-21, 400 N. Lexington Ave., Pittsburgh 8, Pa.

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stroke is 6 in. Feed per revolution is 0.0035 in. reducible to 0.002 in.; rpm ranges are 465, 900, and 1400.

Unit, designed for mounting on workholding fixtures or large assembly jigs, consists of a cylinder housing, oil reservoir, bearings, boring spindle assembly, control valve, and spindle drive assembly. It can be equipped with manual, solenoid, or air-operated controls.

Greenlee Bros & Co, Rockford, Ill

WELDING PRESS can be used for multi-spot, multi-projection, and multi-cross welding, brazing, hot upsetting, and mash welding—*Combined Welder & Machine Corp, 73-40 Grand Ave, Maspeth 78, NY*

Vapor Steam Cleaner Designed For Heavy Duty Operations

Model 120, for one-man operation, is fully automatic. From the point at which the dry cleaning compound is placed in the tank until it emerges as a super saturated jet of steam from the gun, entire mixing operation is automatic. Solution is fed into the steam stream in desired strength as selected by a metering valve on the instrument panel.

Unit is available in stationary or portable models of 120-gal capacity. Attachments include the Aqua-Jet Gun for handling special compounds, and the Radi-Flush for cleaning and reverse flushing of clogged engine radiators. Continuous-duty, full bearing, ½-hp motor powers the unit.

Circo Equipment Co, Clark, NJ

Epoxy Material is Strong Enough For Medium-Run Metalforming Dies

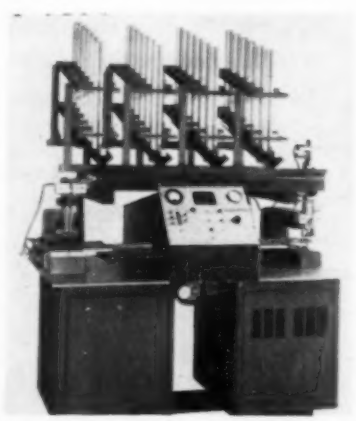
Epoxy-Alloy, a new metal-fiber-reinforced epoxy composition, is reported to further extend the advantages of plastic tooling. The reduced tooling time and cost economies inherent in plastic tooling can now be realized in the production of medium-run metalforming dies.

The term "Epoxy-Alloy" refers not only to the new material, but also to a method for effectively using the material. Basically, an Epoxy-Alloy tool or die is a mass casting, made by a pressure process, consisting of a heat-resistant epoxy system reinforced with metal or glass fibers. Three different compositions are available. Type ES is an epoxy mass casting reinforced with steel fiber and surfaced with an epoxy steel-fiber flocked face coat; Type EG-SF is reinforced with glass fiber and surfaced with an epoxy steel-fiber flocked face coat; Type EA is reinforced with aluminum fiber and surfaced with an epoxy aluminum.

Although Epoxy-Alloy provides considerable savings over standard metal dies, it will cost more than a simple casting of compounded epoxy. For this reason, these new compositions have been designed for use where conventional plastic tooling is impractical.

Among the advantages claimed for the new materials are thermal conductivity up to 60 times better than present plastic materials; ability to mass cast in large volumes to complicated shapes with lower exotherm; high heat resistance and resistance to thermal shock; higher impact strength and rigidity. Tests have shown that draw dies of Epoxy-Alloy can be used (1) for runs of 50,000 to 150,000 or more stampings of the thinner more easily formed metals; (2) for runs of 10,000 to 50,000 stampings in which Epoxy-Alloy contoured punches and pads are used with metal inserts, draw rings, and blank holders; (3) for runs of 1000 to 10,000 stampings without metal rings or inserts; and (4) for prototype or development runs encountering deep draws of heavy metal or large compound-contour stampings up to ¼-in.-thick steel.

Bakelite Co, Div of Union Carbide Corp, 30 E 42 St, New York 17, NY



AUTOMATIC AUTO-BOARD, designed for the electronics industry, positions circuit boards, drills holes, selects components, and inserts the components in proper sequence. Information is fed to machine on punched tape—*Design Tool Corp, Electro-Machinery Div, 80 Washington St, New York 6, NY*

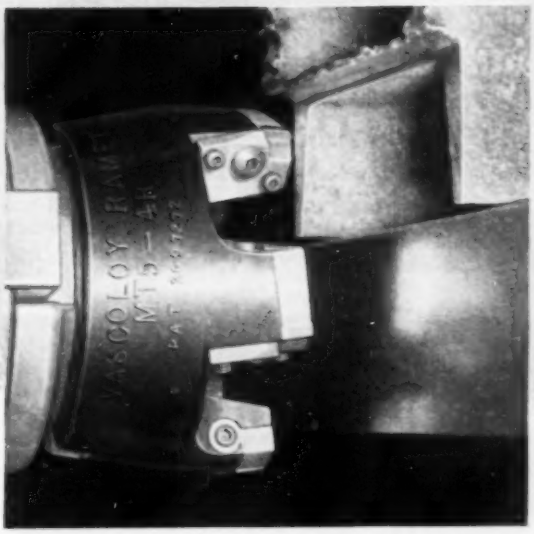
USE V-R CARBIDES
for Greater Production

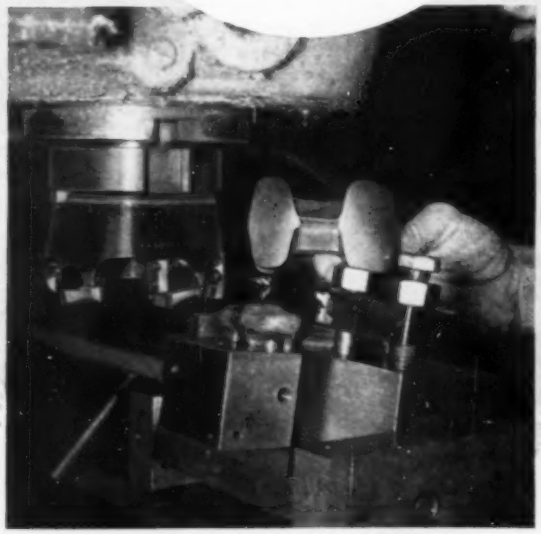
VR-75

for milling all types of Steel

VR-54

for milling cast iron, chilled cast iron, non-ferrous alloys and non-metallics





Make these two V-R grades your first choice for increasing production and reducing down time on your *milling* operations: **VR-75** for all types of steel, resists shock, abrasion and excessive heat. **VR-54** for materials other than steel, incorporates toughness with high hardness to give the greatest possible resistance to abrasion and shock.

For complete information on the application of these two superior carbide grades, call your local V-R representative or field service engineer.

MANUFACTURERS OF: CEMENTED CARBIDES, TANTUNG® CAST ALLOY CUTTING TOOLS, TOOLHOLDERS and THROW AWAY FACE MILLING CUTTERS

25 YEARS

Vascoloy-Ramet Corporation

SUBSIDIARY OF FANSTEEL METALLURGICAL CORPORATION

836 Market Street • Waukegan, Illinois

C-655

AC-DC Arc Welder Available in Two Models

Combination ac transformer, dc rectifier arc welder can also be used for inert gas welding.

Welding with either ac or dc (straight or reverse polarity) is accomplished by shifting a selector switch. Unit is provided with magnetic line switch and removable rheostat for remote control at no extra cost. Current overload device protects both transformer and rectifier; thermostat provides an additional safeguard for the rectifier. Both of these devices open the primary contactor, assuring full overload protection.

Model AD-264-S is rated 200 amp at 40 v, has welding range of 12 to 330 amp ac, 12 to 360 amp dc. Model AD-364-S is rated 300 amp at 40 v, has welding range of 12 to 420 amp ac, 12 to 400 amp dc.

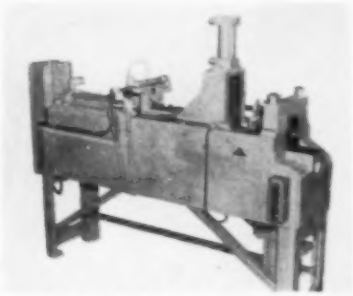
Hobart Brothers Co, Hobart Square, Troy, Ohio

Bench-Type Punchpress Offered in 3-ton Model

Model B-3 can be adapted for any standard punching operations within rated capacity. On continuous operation, unit will reportedly produce up to 300 articles per min.

Features include single-pin quick-action clutch with positive, non-repeat or repeat action. Standard stroke is 1 in.; ¼ to 1½-in. strokes available at additional charge. Total weight is 123 lb less motor. Price of $139.50 includes adjustable crankshaft brake, motor mount, V-belt and motor pulley, less motor.

Alva Allen Industries, 1001-15 North 3rd St, Clinton, Mo

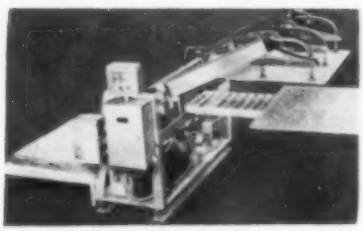


New Tube End Forming Machine Added to Vaill Line

No. 7S Double Stroke unit, hydraulically operated, is reported to have smooth, quiet motion. Tube is clamped in a pair of split blocks and a tapered ring is pushed over end of tube. Inside sizing mandrel used in conjunction with the second operation reducing ring permits a close tolerance to be held on the ID of the reduced section.

In addition to reducing or pointing the ends of tubing, unit can also be tooled up for expanding in diameter, flanging, flaring, double flaring, and beading the ends. Combinations of these shapes may be obtained through use of the double stroking feature.

Vaill Engineering Co, 137 E Main St, Waterbury 20, Conn



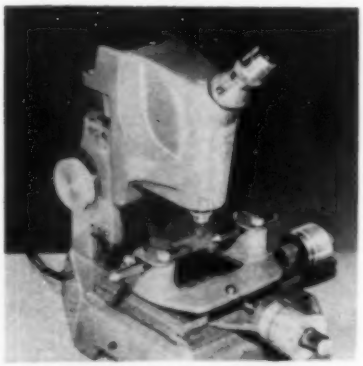
Automatic Sheet Feeder Handles Variety of Materials

Feeder handles metal, plastics, and other materials in flat or formed sheets, either rectangular or irregularly shaped. In addition to delivering from piles to processing equipment, feeder will also remove sheets from conveyors or machine tables for stacking. Material may be picked up and/or delivered horizontally, vertically, or at any angular position.

Machine, which uses a "suction-cup carrier" and "carrier transfer frame" in operation, will feed automatically upon receipt of signals from an associate machine, a timing device, a sheet-sensing mechanism, or from the feeder itself upon discharging a sheet. Feeding cycle can also be triggered manually by push-button.

Sheets up to 6x15 ft can be handled from piles up to 4 ft high at speeds up to 15 per minute.

The de Florez Co, Div of The Dexter Co, 116 E 30th St, New York, NY



Toolmaker's Microscope Inspects Parts Up to 2½ in. in Depth

Instrument, manufactured by Bausch & Lomb, is designed for inspection and measurement of drills, taps, jigs, templets, broaches, milling cutters, reamers, and small work parts. Working distance is 4 in., permitting focus on objects up to 2½ in. in depth.

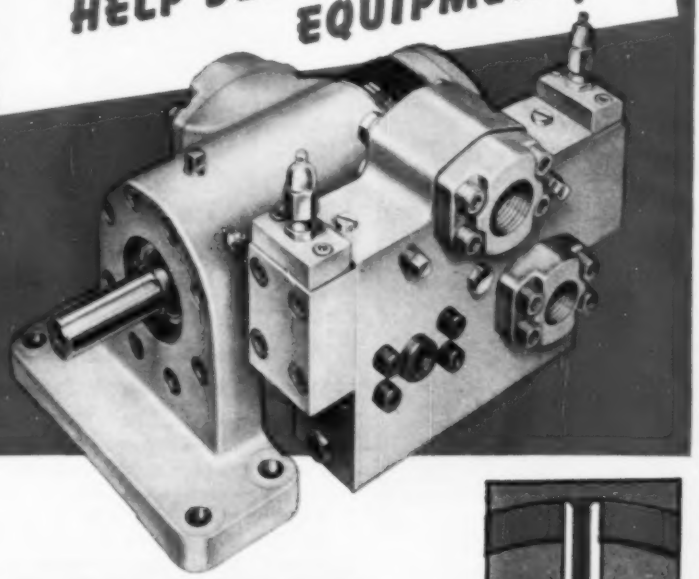
Total range of magnification with interchangeable eyepiece and objective lenses is 27X to 360X. Standard lenses supplied give magnification of 35X. Positive focusing is achieved by rack and pinion totally enclosed within microscope head. Cross-slide stage moves on spring-loaded ball bearings. Measurement is possible in two directions, controlled by micrometer spindles reading directly to 0.0001 in. Total range of stage movement is 1 x 2 in.

Optional accessories include interchangeable protractor eyepiece that permits accurate measurement of angles not possible with standard eyepiece. Center support with centers, easily attached to cross-slide stage, permits measurement of cylindrical objects.

DoAll Co, Des Plaines, Ill

Consider HYDRECO Dual-Vane Double Pumps with Valve Panels from the Standpoint of Their Ability to—

HELP SELL YOUR EQUIPMENT!



HYDRECO

DUAL-VANE CONTROLLED FLUID POWER

Contributes Added Flexibility to Machine Tool Performance

HYDRECO Dual-Vane PF-100 Series Double Pumps with combination relief and unloading valves provide high circuit flexibility through either automatic or external pilot control. For example . . . in a "hi-lo" circuit, large volume delivery is available for a fast traverse cycle. Then, during the feed cycle, when small volume is required, one pump section unloads automatically . . . saving dollars in horsepower! These pumps can also be operated on separate circuits . . . each circuit protected by its own relief valve.

Dual-Vane Pumps can operate *continuously* at 2000 psi and up to 1800 rpm. Their exclusive "Dual-Vane" feature and advanced design combine to assure long, trouble-free performance and maximum simplicity in servicing. Thus, they are a natural choice for a wide variety of high production equipment, including: Machine Tools, Hydraulic Presses, Die Casting and Plastic Moulding Machines, Closing and Clamping Devices and other functions calling for controlled variation in Pump volume.

TWO VANES ARE BETTER THAN ONE

The hydraulically counterbalanced DUAL-VANES in these HYDRECO Hydraulic Pumps eliminate wear-producing loads normally caused by unbalanced hydraulic forces and vane acceleration. DUAL-VANES also maintain MULTIPLE SEALING BARRIERS to slippage and power loss. DUAL-VANES are a patented and exclusive HYDRECO feature.

Member NFPA

The PLUS factors in HYDRECO Dual-Vane Pumps weigh heavily at the sales end—so, WRITE . . . get the facts on Dual-Vane Hydraulic Pumps and Fluid Motors.

THE NEW YORK AIR BRAKE COMPANY

KALAMAZOO DIVISION • KALAMAZOO, MICHIGAN

THESE WELL-KNOWN HYDRAULIC SPECIALISTS ARE DISTRIBUTORS OF

HYDRECO

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ROCKFORD—Barker-Rockford Co., 110 Cedar St.
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INDIANAPOLIS—Tec Engineering Company, 132 E. 30th St.
LOGANSPORT—Tec Engineering Company, P. O. Box 4
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WICHITA—Baker Engineering & Equipment Co., 305 Pattie Ave.
KENTUCKY
LOUISVILLE—Scott Industrial Equipment Co., 660 S. 5th St.
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DETROIT—J. N. Fauver Co., Inc., 51 W. Hancock Ave.
FLINT—J. N. Fauver Co., Inc., 3140 Hemphill
GRAND RAPIDS—J. N. Fauver Co., Inc., 2147 Englewood Drive
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MISSOURI
KANSAS CITY—Baker Fluid Power Co., 3323 Summit St.
NEW JERSEY
TRENTON—The Battersby Corp., 129 Homestead Ave.
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BUFFALO—R. C. Neal Co., Inc., 76 Pearl St.
ELMIRA HEIGHTS—R. C. Neal Co., Inc., 161 E. 14th St.
PELHAM MANOR—Neilsen Hydraulic Equip., Inc., 4 Penn Place
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WASHINGTON
SEATTLE—The Rucker Company, 1000 — 4th Ave.
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MONTREAL—Affiliated Engineering Co., 940 Cote de Liesse Road
TORONTO—Stratoflex of Canada, Inc., P. O. Box 49
EDMONTON—Affiliated Engineering Co., 10042 — 109th St.
WHITE ROCK, B.C.—Stratoflex of Canada, Inc., 13677 Marine Drive

Kalamazoo Division
The New York Air Brake Company
9001-2 East Michigan, Kalamazoo, Mich.

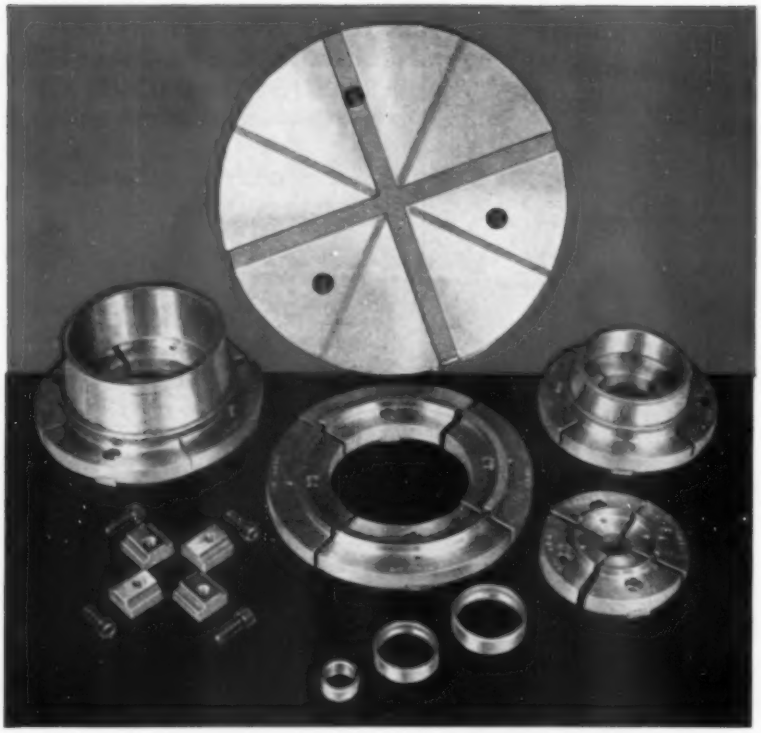
Please send me Bulletin DP-308C fully describing HYDRECO Dual-Vane Double Pumps with Valve Panels.

Name_____

Company_____

Address_____

City_____ Zone____ State_____



FOR GREATER HOLDING FLEXIBILITY

on internal or external work

USE WALKER MAGNETIC DRIVERS

This rotary electromagnetic chuck consists of a 4-pole face plate with 4 T-slots that give a wide range of diameter adjustments to the segment type drivers. With the use of a Neutrolator control, holding force may be controlled from maximum to a degree which allows for the slippage required by shoe type support.

This recent Walker development has received wide acceptance by bearing race manufacturers who demand distortion-free chucking at high production rates and low unit cost.

Walker magnetic drivers are made on special order in any size to meet work requirements.

Write for new Catalog No. 58 which describes all O. S. Walker permanent & electromagnetic chucks.

O. S. WALKER COMPANY, INC.

WORCESTER 6, MASSACHUSETTS, U. S. A.

The Original Designers and Builders of Magnetic Chucks

Shaper Makes Irregularly Shaped Stamping and Electrode Punches

Improved K-150 form and punch shaper makes irregularly shaped stamping and electrode punches of high precision (±0.00025 in.). The larger dividing head with automatic circular feed permits the machining of radii and angles automatically.

All work pieces are clamped directly in a collet holder, between centers or to the co-ordinate chuck. Co-ordinate chuck and indexing attachment guide the workpiece along the contour with one chucking, thus eliminating re-chucking errors. Operations can be checked with the special, built-in 30-power microscope.

Jersey Mfg Co, 407 Livingston St, Elizabeth 1, NJ

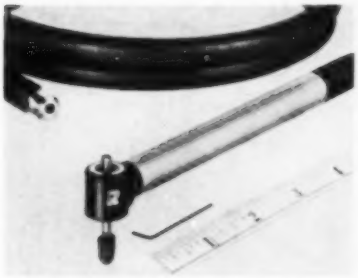
Fenn Introduces Improved Swaging Machine

Model 1F is designed to replace the former Model 1A. Improvements include an extra heavy, one piece cast frame that provides rigidity, perfect

alignment, and freedom from vibration.

Unit also incorporates heavier drive. Motor and electrical parts are mounted within the frame. Model requires floor space of 25 x 20½ in., weighs 625 lb.

Fenn Manufacturing Co, Fenn Rd, Newington, Conn



Air-Powered Deburring Tool Works in ⅞-in. Openings

Miniaturized air-powered tool designated AirBurr, for deburring, drilling, grinding and polishing, rotates at speeds up to 150,000 rpm and operates on 15 to 100 psi air. Developed originally for work on aircraft valves, tool can be used for tool, die and mold finishing, instrument making and other hand operations. Only 13/16 in. across the corners of the head, tool accepts standard ⅛-in.-shaft tools, and can be used in openings as small as ⅞ in. Price is $24.50. Literature available.

Ellison Engineering Co, 4530 San Fernando Rd, Glendale 4, Calif

Acetylene Generator Incorporates Automatic Signal System

Oxweld MP-11 with carbide capacity of 500 lbs will produce 1000 cu ft of medium-pressure acetylene per hour. Delivery rates of up to 2000

Improved Lusol..

A BETTER PRODUCTION METHOD

Improved Lusol, an oil-free transparent water-soluble solution, will give superior performance in a wide variety of grinding operations. The combination of lubricity and maximum cooling make Lusol especially indicated for Centerless Grinders where a fine low micro inch finish is required.

PROOF THAT LUSOL MEANS LOWER COSTS— BETTER RESULTS

THE WORK: Grinding seals for jet engines on Heald Rotary Grinder. **MATERIAL:** Chrome and S.A.E. 8740 Stainless Steel. **CUTTING SPEED:** 1800 R.P.M. **DILUTION:** Lusol 30-1, former coolant 20-1. **COST PER GALLON IN MACHINE:** Lusol 6½¢, former coolant 8¢. **PIECES PER DRESSING:** Lusol, 20; former coolant 15. And Lusol made possible a 5 micro finish which could not be achieved with the former coolant.

Lusol.. BETTER PRODUCTS FOR BETTER METALWORKING

Send for 16-page descriptive booklet.

ANDERSON OIL and CHEMICAL COMPANY, INC.

BOX 215, PORTLAND, CONNECTICUT

What is your swaging I.Q.?

Are you aware of the new techniques and equipment that are making rotary swaging increasingly important as a basic precision production process? Test your knowledge of modern rotary swaging with this TRUE or FALSE quiz.

SWAGING is economical—no chips, no scrap . . .

SWAGING produces work accurate within ± .001" . . .

SWAGING improves physical characteristics . . .

SWAGING can produce inside contours . . .

SWAGING can be automatic or semi-automatic and does not require skilled labor for operation . . .

FENN is one of the largest manufacturers of a complete size range of swaging equipment . . .

FENN swaging equipment swages tubing up to 6¼" diameter and solid bar stock from pinpoint to 3¾" diameter . . .

If you answered TRUE to all the questions, your knowledge is excellent. If not, you should have more information on modern rotary swaging.

In either case, it will pay you to get a copy of the new Fenn Swaging Catalog No. SM56. Write today!

FENN ROTARY Swaging Machines

FENN MANUFACTURING COMPANY • 101 FENN ROAD, NEWINGTON, CONN.

cu ft are obtainable over shorter intermittent operating periods.

New automatic signal system consists of a howler and indicator lights that provide both audible and visual warning if minimum carbide supply, water level, or water temperature should deviate from normal.

Linde Co, Div of Union Carbide Corp, 30 E 42nd St, New York 17, NY

Tool Holds Punches or Pilots Accurately and Positively

The Acu-Quill is designed to hold punches or pilots accurately and positively and provide for their quick and simple replacement. The tool is hardened, honed and ground; tolerances are ±0.0003 in. Special wrench (illustrated) simplifies replacement of punches while dies are still in the press. Two quill sizes are available. The Q14 and Q38 will accommodate punches to ¼ and ⅜ in. respectively. Minimum spacing between the smaller models is ½ in.; between the larger models, ⅝ in.

Punches are supplied in the form of hardened blanks, ground on the diameter that fits the quill. Punch blanks are stocked in increments of 1/16 in. dia x ½ in. long, and are available in oil hardening steel and in high-carbon high-chrome steel.

B & G Tool Co, 4610 16th Ave, Brooklyn 4, NY

"Reactor Grade" Ferro Columbium Introduced by Shieldalloy Corp

New grade with high columbium-to-tantalum ratio—about 40:1—is said to be especially advantageous in the manufacture of stainless steel components of nuclear reactors since tantalum has the disadvantage of capturing neutrons.

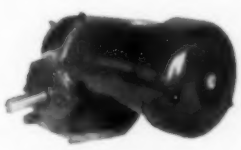
According to Shieldalloy engineers, the 0.8% tantalum content of the new material will assure manufacturers of columbium-containing

Now... Century announces a completely new line of fractional-HP right angle shaft type GEARMOTORS

New, "Smaller and Better" 48 and 56 Frame Century Motors

Weight reductions up to 1/3
Gearmotors operate in any position
Compact design saves space
Tapered roller bearings on low speed shaft
Finest rotary face-type oil seal on high speed shaft
Wide variety of mounting and motor types

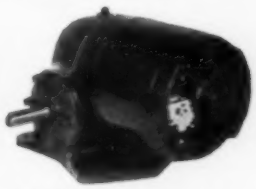
Single reduction AGMA output speeds from 25 to 280 RPM (Double reduction as low as 4 RPM)



For floor mounting, complete with new type 56-Frame totally-enclosed, fan-cooled motor. External fan fully protected by cover. Substantial mounting on gear housing supports overhung loads on shaft. Type SC three phase motor shown. Ratings up to ¾ HP.

New IR 40 with 48-Frame motor. Gear housing shown is in one of eight possible positions. Open type single phase capacitor-start Type CS motor. Strong welded foot assembly and heavy motor frame assure smooth operation with severe sprocket loading. Ratings up to ½ HP.

Typical special purpose mounting to suit driven machine. Output shaft is vertical downward extension, properly sealed against oil leakage. Capacitor-start type motor has special smooth cover over capacitor and terminal connections to facilitate cleaning to meet sanitary requirements. Ratings up to ¾ HP.



Basic horizontal unit as assembled with 56-Frame open type motor. Motor is Type SC polyphase. Multi-speed, crane and hoist duty and other special types available. Note convenient vent and filling plugs on gear housing. Ratings up to ¾ HP.

Call your nearby Century District Sales Office or Authorized Distributor

. . . Your best motor investment is Century

81

Performance-Rated MOTORS 1/20 to 400 HP

CENTURY ELECTRIC COMPANY

18th and Pine Sts. • St. Louis 3, Missouri • *Offices and Stock Points In Principal Cities*

Why *concave sides* insure longer V-Belt life

With one simple test you can demonstrate to yourself why the concave sides (Fig. 1) of the Gates V-Belt insure far longer belt life.

Just feel the sides of a Gates V-Belt on the bend. Note that in bending around the sheave these sides fill out and become straight (Fig. 1-A). That means the belt makes full contact with the sides of the sheave groove; grips the sheave *evenly*.

This even contact distributes wear uniformly across the sides of the belt. Uniform wear lengthens belt life; keeps costs down.

Now make the same test with a straight-sided belt (Fig. 2) and see what happens. The sides bulge out on the bend (Fig. 2-A) concentrating wear at the points shown by arrows. Uneven wear shortens belt life; increases belt costs.

Cut V-belt replacement costs and down time. Specify belts that grip evenly and wear longer . . . specify Gates Vulco Rope — the V-Belt with concave sides.

The Gates Rubber Company • Denver, Colorado

World's Largest Maker of V-Belts

There are Gates Engineering Offices and Distributor Stocks in all industrial centers of the United States and Canada, and in 70 other countries throughout the world.

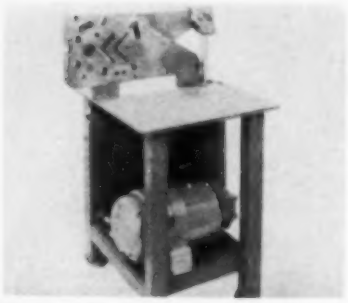
TPA 150

Gates VULCO ROPE Drives

NEW SHOP EQUIPMENT

cast (ACI type CF-8C) and wrought (AISI type 347) stainless reactor parts that their products are well within the AEC specification of 0.10% max tantalum content. Since regular ferro-columbium has Cb:Ta ratio of about 10:1, tantalum contents of the finished part often exceed the specified maximum.

Shieldalloy Corp, Newfield, NJ

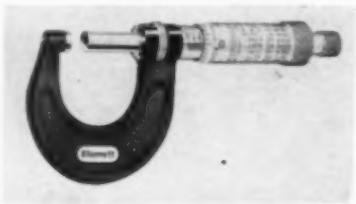


Shearing Machine Cuts Variety of Steel Sections

The Shear-Ease is designed to cut or shear steel angle iron up to 4 x 4 x ⅜, steel flat bars up to 3¾ x ⅜, steel rounds up to 1 in., and steel squares up to 1 in. It will also cut chain, cable, and reinforcing steel.

Power is derived from hydraulic pump attached to electric motor. Pump can also be driven by a gasoline engine of 3 or more horsepower. This 650-lb unit reportedly can do most of the work of a conventional shearing machine with the exception of punching. Use of dolly wheels makes it portable.

Hydraulic Tool & Equipment Co, 10825 Sessler St, South Gate, Calif



1-in. Micrometer Caliper Has Built-In Precision Features

Frame of No. 436 Series outside micrometer caliper is specially forged and ribbed for extra strength and tapers to the anvil to permit use in narrow slots and tight places.

Anvil and spindle faces are hi-micro-lapped to mirror finish; instru-

(Continued on page 170)

GUIDE PINS and GUIDE PIN BUSHINGS

Because high production, quality control and longer die life have become all-important, most stamping plants have now standardized on Lamina guide pins and Lamina bronze-plated bushings.

All Lamina wring-fit bushings are pre-finished on the I.D. Seated on a ground shoulder square with the surface of the die shoe and secured by special retainers, they assure distortion-free, full bearing surface that results in better die alignment, less maintenance and longer die life.

Lamina guide pins are special tool steel, heat treated, spray quenched, ground and burnished. The uniform, hard surface resists wear and the tough core prevents bending during installation or use. The pins are dimensionally accurate, do not "mushroom" or get out of round, and require no "running in".

There is a type and size Lamina Guide Pin and Bushing for every need. Our new catalog gives illustrations, applications, dimensions and prices of more than 800 items. Write for free copy.

LONG SHOULDER TYPE—Small toe clamp. Use to keep guide pin in bushing during stroke. Long wearing bronze plated on hardened steel, ¼" to 3" pin dia.

HEAVY DUTY—Large toe clamp, for large and heavy die sets requiring extra body and shoulder thickness. Bronze plated, 2" to 3" pin diameter.

NUT TYPE—For wide range of requirements. Available in 5 sizes, 1" to 2" pin diameter, long-wearing bronze plated on hardened steel.

LONG SHOULDER TYPE—Large clamp. Long bearing surface contains pin during entire stroke. 2" to 3" pin diameter. Bronze on steel.

SHORT SHOULDER TYPE—For die space, more bearing area within die area. Bronze on steel or solid Ampco Bronze. 7 lengths, pin sizes ¼" to 2".

RING CLAMP TYPE—For heavy duty and bossed die sets. Bronze-plated steel or Ampco Bronze, 4 lengths, pin diameter 2½" to 4½".

Lamina
DIES AND TOOLS, INC.
P.O. BOX 31, ROYAL OAK, MICHIGAN

PRODUCING

LE MAIRE

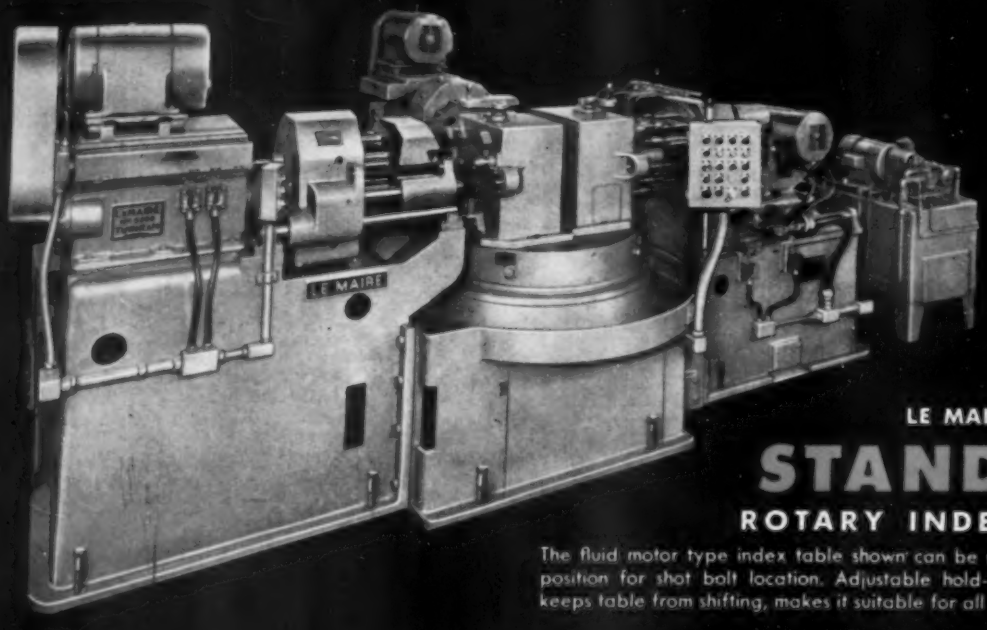
STANDARD
MILLING HEAD UNITS

Vertical milling head cleans up mounting face of oil pump covers. Other operations on this machine include drilling and reaming. Production is 90 parts per hour at 100% efficiency.

LE MAIRE

STANDARD
DRILLING UNITS

Multiple tooling on standard units performs drilling, reaming, counterboring and tapping of 75 flywheels hourly. While units shown are quill type, LeMaire also manufactures standard way type units.



LE MAIRE

STANDARD
ROTARY INDEX TABLES

The fluid motor type index table shown can be set to stop in exact position for shot bolt location. Adjustable hold-down arrangement keeps table from shifting, makes it suitable for all types of machining.

with LE MAIRE

STANDARD BUILDING BLOCKS

Give You Economy . . . Flexibility . . . Simplicity

Before you automate . . . *investigate* the complete LeMaire line of standard hydraulic power units. Each is practical, efficient, economical . . . and nearly as flexible in application as a standard electric motor!

These LeMaire "building blocks" are designed for interchangeable installation on a wide variety of standard bases. This allows low-cost unitized construction, in minimum lead time, of a "special" which solves *today's* production machining problem . . . and which can be economically converted or modified to meet *future* needs.

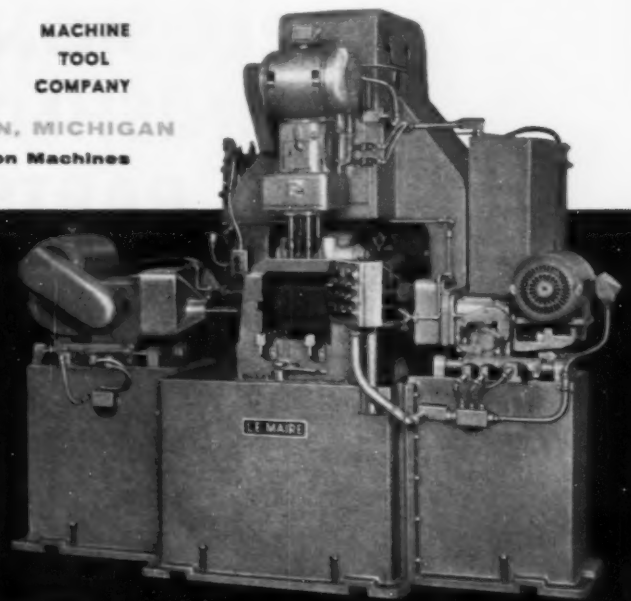
LeMaire standard units are suitable for drilling, boring, counterboring, reaming, spot-facing, tapping and milling. They operate in horizontal, vertical or angular positions. Infinite control of feeds is provided, along with construction which assures twist-free, straight line, uniform operation under all production conditions. All units are built to J.I.C. standards.

For practical, economical, flexible automation, check the possibility of using LeMaire "do-it-yourself" building blocks . . . or ask LeMaire engineers to recommend the right combination for your specific production machining problem. Send parts or prints for prompt recommendations.

LE MAIRE MACHINE TOOL COMPANY

2657 S. TELEGRAPH ROAD • DEARBORN, MICHIGAN

Designers and Builders of Special High-Production Machines

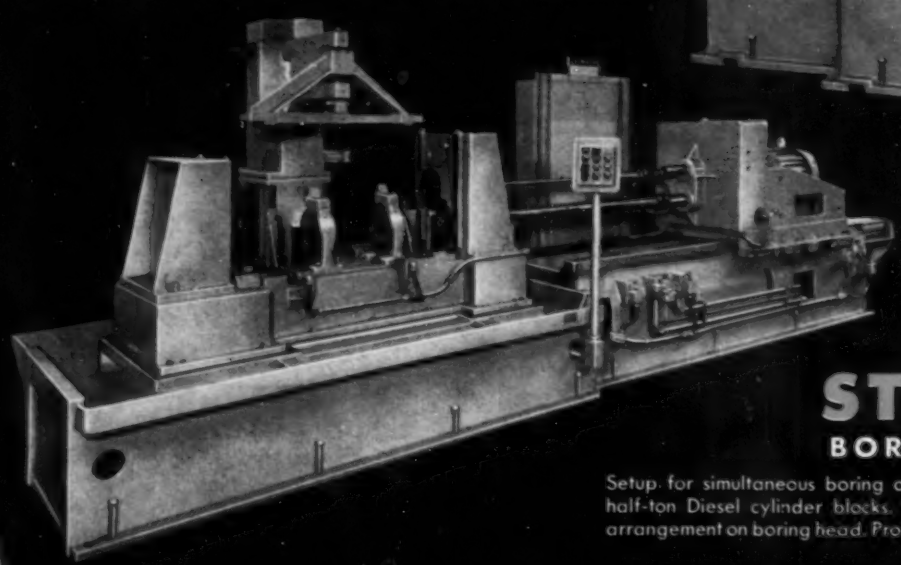


LE MAIRE

STANDARD

LEAD SCREW TAPPING UNITS

Four sides of farm tractor hydraulic reservoir are tapped at once by this machine, arranged with various size master lead screw tapping units. Production is 56 parts per hour at 100% efficiency.



LE MAIRE

STANDARD

BORING HEAD UNITS

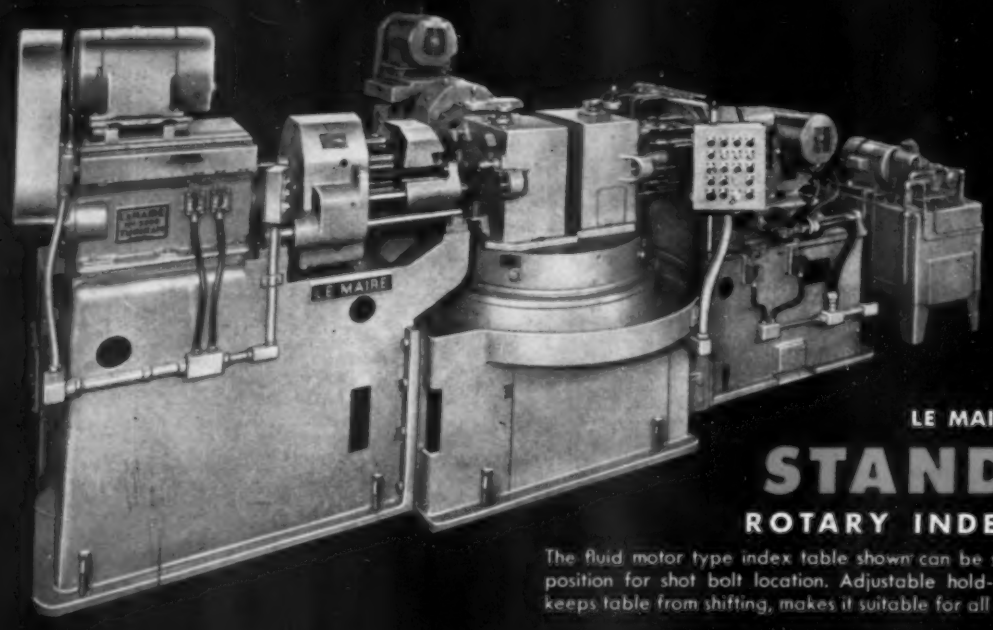
Setup for simultaneous boring of camshaft and crankshaft bores in half-ton Diesel cylinder blocks. Way type unit has tool positioning arrangement on boring head. Production is 9.4 cylinder blocks per hour.

LE MAIRE

STANDARD

DRILLING UNITS

Multiple tooling on standard units performs drilling, reaming, counterboring and tapping of 75 flywheels hourly. While units shown are quill type, LeMaire also manufactures standard way type units.



LE MAIRE

STANDARD

ROTARY INDEX TABLES

The fluid motor type index table shown can be set to stop in exact position for shot bolt location. Adjustable hold-down arrangement keeps table from shifting, makes it suitable for all types of machining.

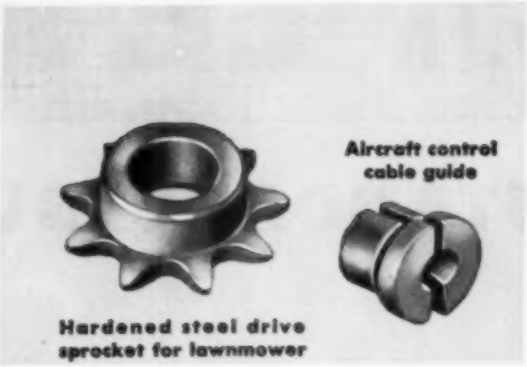
WHATEVER THE APPLICATION...

you can improve your product with

GRAMIX®

(PRODUCT OF POWDER METALLURGY)

PRECISION FINISHED PARTS



Hardened steel drive sprocket for lawnmower

Aircraft control cable guide

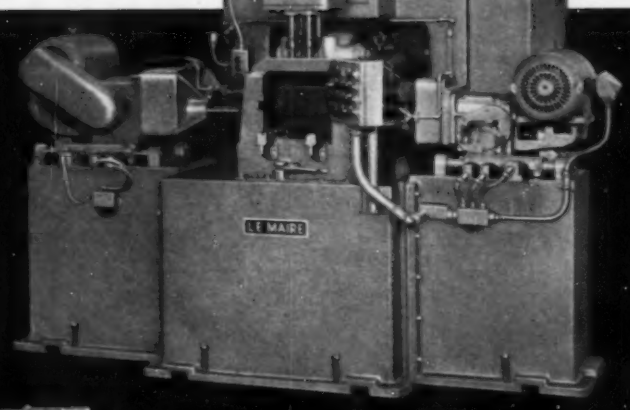
Self-aligning guide bearing for industrial blower shaft

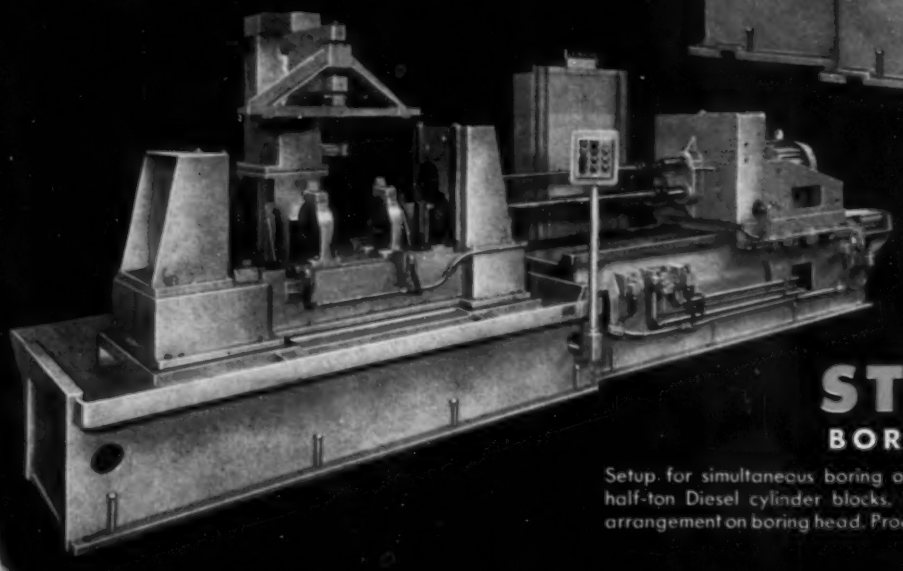
LE MAIRE

STANDARD

LEAD SCREW TAPPING UNITS

Four sides of farm tractor hydraulic reservoir are tapped at once by this machine, arranged with various size master lead screw tapping units. Production is 56 parts per hour at 100% efficiency.



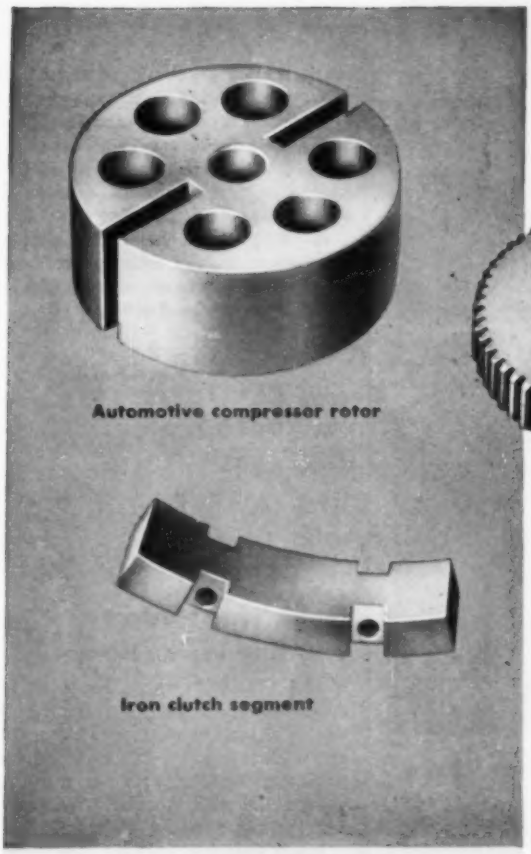


LE MAIRE

STANDARD

BORING HEAD UNITS

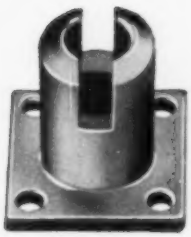
Setup for simultaneous boring of camshaft and crankshaft bores in half-ton Diesel cylinder blocks. Way type unit has tool positioning arrangement on boring head. Production is 9.4 cylinder blocks per hour.



Automotive compressor rotor

Iron clutch segment

Infiltrated iron gear for lawnmower



Iron switch control

Rotor for gasoline pump

Packing gland follower used in hydraulic system

WHATEVER THE APPLICATION...

you can improve your product with

GRAMIX®

(PRODUCT OF POWDER METALLURGY)

PRECISION FINISHED PARTS

Hardened steel drive sprocket for lawnmower

Aircraft control cable guide

Self-aligning guide bearing for industrial blower shaft

GRAMIX precision finished parts are improving products in virtually every branch of industry. A pump manufacturer, for instance, may specify a gasoline pump rotor made of GRAMIX and gain a number of advantages.

To begin with, the alloys are carefully blended to meet his individual requirements. The GRAMIX parts are then die-pressed to exact shape, sintered under rigid control and finished to tolerances as close as .0005". (This process, of course, costs far less than machining, forging or casting.) The manufacturer can expect the GRAMIX gasoline pump rotor to do a better job because *all* GRAMIX parts are precision engineered and precision controlled from alloying to finishing.

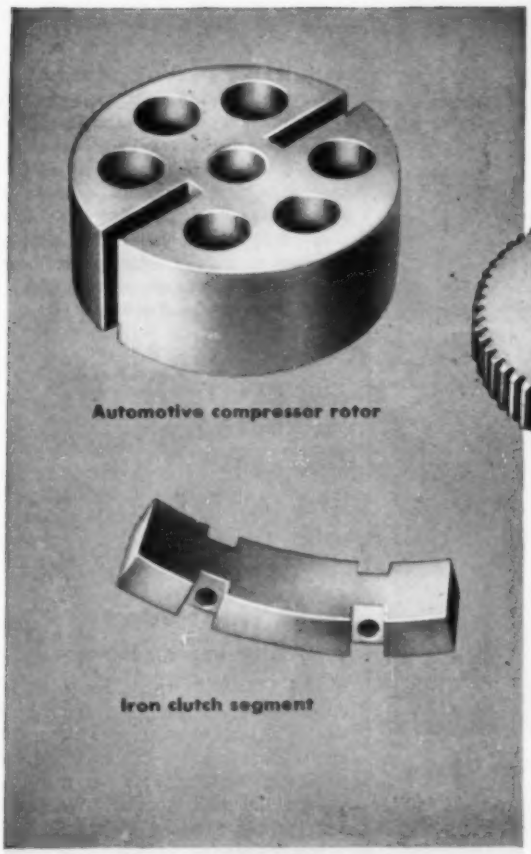
No matter what the application may be, GRAMIX parts fit specifications exactly. Parts may be impregnated with oil . . . to insure a longer life and a quieter operation: if specified, the GRAMIX parts may be coined and work hardened, even prepared for plating.

The rotor is only one of thousands of applications in which GRAMIX precision finished parts have proved to be ideal. Just a few of them are shown here, so consider the components of your products . . . there may be several that could be improved . . . with GRAMIX! Products of powder metallurgy you can rely on.

PM MEMBER

THE UNITED STATES

GRAPHITAR® CARBON-GRAPHITE • GRAMIX® POWDERED METAL PARTS • MEXICAN® GRAPHITE PRODUCTS • USG® BRUSHES



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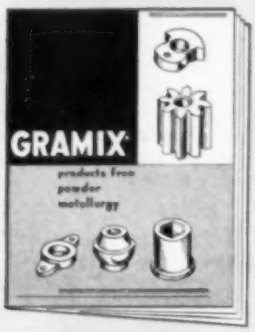
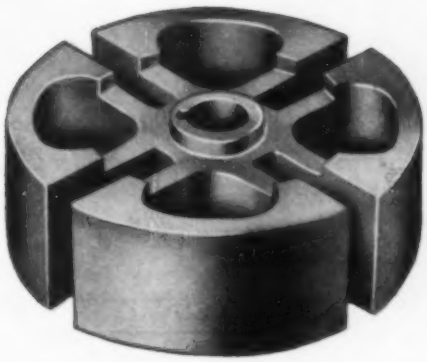


Write today for factual Engineering Bulletin No. 21 . . . we'll send your copy right along.



Bronze rotor in high speed fueling unit

X-253-1

GRAPHITE COMPANY

DIVISION OF THE WICKES CORPORATION, SAGINAW 23, MICHIGAN

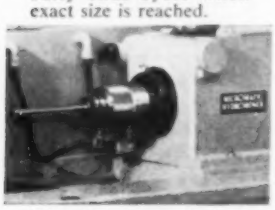
WHY "150" HYDROHONER

Reduces Costs . . .
Assures Controlled Finish . . .
Provides Rapid Stock Removal

To assure rapid stock removal and consistent generation of surface finish desired, the low-cost "150" Hydrohoner utilizes the distinctive Microhoning characteristic of self-dressing abrasives. Because abrasive grits are kept sharp-cutting at all times by a combination of controlled pressure and reciprocating-revolving motions of tool, a constantly high cutting efficiency is effected.

Basic "150" Hydrohoner —delivered from stock.

Microsize gage automatically ends cycle when exact size is reached.



Microdial automatic feed control and stone wear compensation.

Possessing a 12-inch stroke and a work diameter capacity of 1½ inches, the standardized "150" readily accommodates a variety of fixturing and tooling to assure easy adaption to a wide variety of work parts. Also, by addition of standard packaged units produced by Micromatic, it can be partially or fully automated.

Performing to the standards of higher-priced, special-purpose honing machines and incorporating features of a general-purpose design, the "150" Hydrohoner is an economical, long-range investment for long or short production runs.

Send Coupon for Complete Information.

Learn why Microhoning will give efficient stock removal, closer tolerances, accurate alignment and functional surfaces.

☐ Please have a Micromatic Field Engineer call.
☐ Please send Micromatic literature and case histories.

NAME_____

TITLE_____

COMPANY_____

STREET_____

CITY_____ ZONE____ STATE_____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE • DETROIT 38, MICHIGAN

ment is also available with carbide faces. Spindle is one piece for extra rigidity. Decimal equivalents of 8ths, 16ths, and 64ths are located on the large diameter thimble. Unit is furnished with or without a locknut, and is also available (at additional cost) with a ratchet stop at end of thimble or with friction control built in. Catalog gives details.

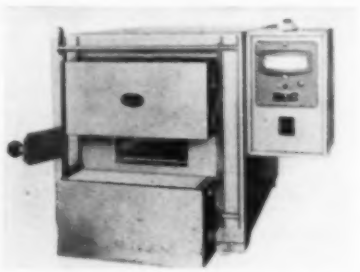
L S Starrett Co, Athol, Mass

Electric Impact Wrench Offered in Improved Model

Model 777, with rated capacity for running and removing nuts on bolts up to ⅜ in. (⅝ in. under favorable conditions), has ½-in. square drive, produces 2000 impacts per min, develops 100 ft-lb torque. Weight is 7¼ lbs.

Improvements include beryllium copper contacts and terminals, unit thrust bearings both for spring and impact mechanism, chrome alloy steel balls, and larger planet gear pins in a new, three-planet system. Brushes shift automatically to assure full power in either direction. List price is $99.50 for wrench alone, $128 for complete kit with carrying case, sockets, and other accessories.

Millers Falls Co, Greenfield, Mass



Four New Models Added to Line Of Electric Furnaces

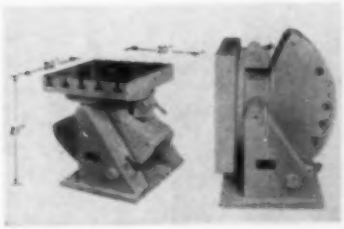
Four electric bench-type furnaces, designated Type 1800, all have the same chamber dimensions, case size and general construction but differ in power requirements (single or three-phase) and top temperature

limits (2000 or 2300 F). All are fitted with close-sealing double doors. If limited access to chamber is desired, the lower section alone can be fully or partially opened. Power to the elements is automatically cut off when the door begins to open.

Twelve identical, helically formed elements line the top, bottom and sides of the chamber. They are made of large-dia wire so as to provide a low watt density with consequent long life. Furnaces may be purchased with or without controls.

Furnaces measure 24 in. wide, 27⅛ in. high and 37¾ in. long. Chamber is 10 in. wide, 9½ in. high and 22 in. deep.

Thermo Electric Mfg Co, 461 Huff St, Dubuque, Iowa



Heavy-Duty Worktable Speeds Drilling and Boring Work

Worktable, designated Tilt-A-Turn, incorporates the means for both angular and radial positioning of workpieces. In addition to providing 360° rotation and eight equally spaced radial locating holes, the cradle-type design of the table permits tilting the work in a number of different planes, from horizontal to vertical. This versatility is reported to speed up all types of drilling, tapping and boring operations.

Interchangeable worktable indexing plates can be provided at low cost to suit a broad range of specific hole patterns.

Galger Engineering & Mfg Co, Rockford, Ill

Welding torch No. 43 operates on high, medium, or low pressures. Handle is completely solderless and all joints are sealed with O-rings. Immediate replacement of any part can be accomplished without special tools or heat assembly.

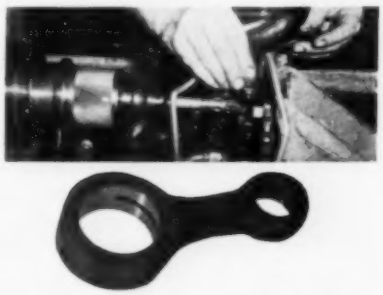
Harris Calorific Co, 5501 Cass Ave, Cleveland, Ohio

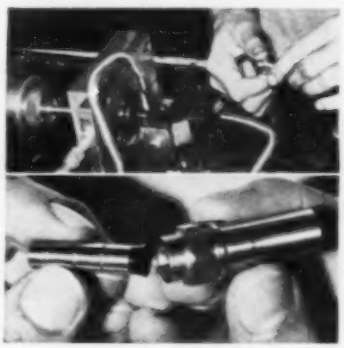
Spiral-fluted HSS chucking reamers are available in sizes from ⅛ to ½ in. dia. and are specially heat treated

HOW Manufacturers Use "150" HYDROHONER To Reduce Costs...Control Finish... Obtain Rapid Stock Removal

Leading Manufacturers of precision parts are using the low-cost "150" Hydrohoner to secure high production, rapid stock removal, geometrical precision and controlled surface finishes. Indicative of the versatility for application of this highly efficient honing machine are the following recent installations:

The crankpin bore of a compressor connecting rod is Microhoned on a "150" Hydrohoner within tolerances of .00015" for taper, and .0002" for size and out-of-roundness. From .0008" to .001" of stock is removed from the bore (.875" diameter x .43" long) in about 8 seconds, while obtaining an 8 Microinch finish.





In this installation, a "150" is Microhoning in two runs the bore (.313" diameter x 1.375" long) of a braking cylinder. The first run removes between .004" and .006" of stock in 30 to 35 seconds. During finishing run, the final .0005" to .0008" is removed to provide geometric accuracy within .0002" tolerance and an 8 Microinch or better finish. Precision and controlled finish of bore prevent hydraulic oil leakage and minimize wear of neoprene-cupped piston.

The principles and application of Microhoning are explained in a 30-minute, 16mm, sound movie, "Progress in Precision" . . . available at your request.

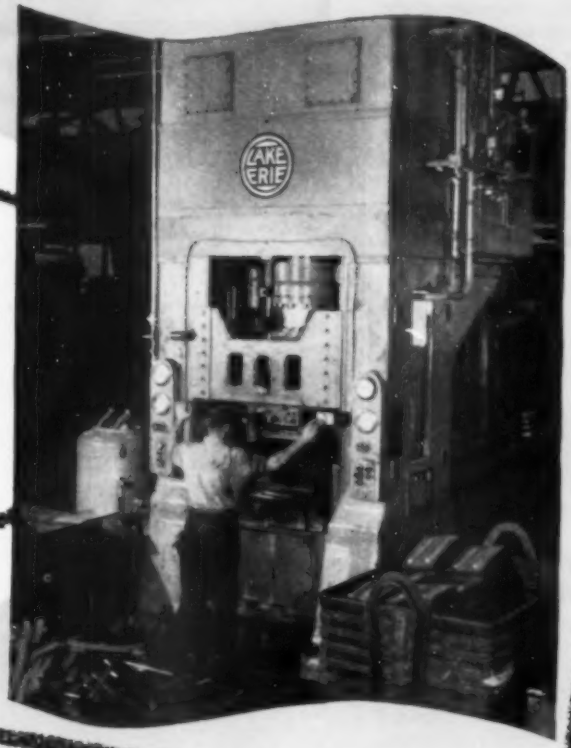
☐ Please send me "Progress in Precision" in time for showing on _____ (date).
☐ Please have a Micromatic Field Engineer call.
☐ Please send Microhoning literature and case histories.

NAME _____
TITLE _____
COMPANY _____
STREET _____
CITY _____ ZONE _____ STATE _____

MICROMATIC HONE CORP.
8100 SCHOOLCRAFT AVENUE · DETROIT 38, MICHIGAN

SURE SIGN OF SATISFACTION

...Repeat orders



ONE OF THE MANY
"Lake Eries" serving "IH" is this 200 ton, side housing, single action press with cushion. Press has an 18" stroke, 36" x 38" bed, closing and return speed of 750"/min., and pressing speed of 67"/min.

INTERNATIONAL HARVESTER

has re-ordered from Lake Erie **19 TIMES**

International Harvester Company ordered their first press from us in the early 40's . . . have added 21 more Lake Erie presses since then. Drawing, forging, hot forming, bending, quenching and straightening are some of the many production operations performed by International Harvester with their Lake Erie presses.

LAKE ERIE
MACHINERY CORP.
BUFFALO, N.Y. U.S.A.

LAKE ERIE MACHINERY CORPORATION, successor to
LAKE ERIE ENGINEERING CORP.
General Offices and Plant: 507 Woodward Ave., Buffalo 17, N. Y.
District Offices in New York, Chicago, Detroit

LAKE ERIE® • Manufacturers of die casting machines and the most complete line of hydraulic presses for all industry.

for maximum wear resistance. The left-hand spiral, right-hand cut keeps the reamer free of chips and allows coolant to reach cutting edges.

Fastcut Tool Co, 7405 E Davison, Detroit 12, Mich

Miniature Punchpress is Operable RH or LH, Forward or Back

Mini-Line press, designed for instrument work, fine punching, staking or forming operations, has close fitting ram that provides absolute accuracy of alignment, according to manufacturer.

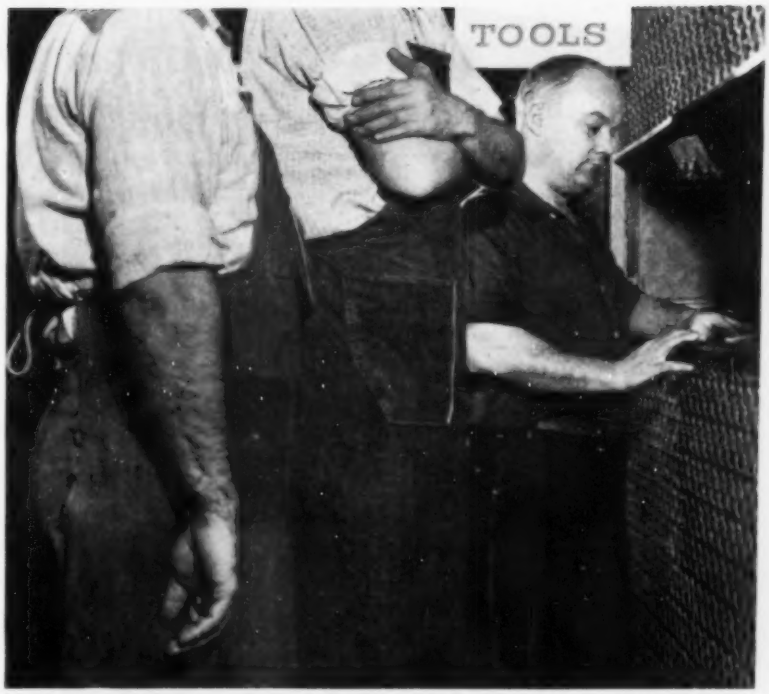
Press has a controlled ⅜-in. stroke and can be operated from both sides, either RH or LH, as well as forward or back by resetting the two-position handle. Accessories include a set of 10 round punches in sizes from 0.020 to ¼-in.; pedal kit for foot operations, dieset for making dies, and an eyelet set in 1/16, 3/32, and 1/8-in. sizes. Bulletin available.

Magnetec Corp, 11785 W Olympic Blvd, Los Angeles 64, Calif

Balancing Machine Determines Angles and Amount of Unbalance

The Rava (Italian) static-dynamic balancing machine employs an electrical measuring system. Both the angle and the amount of unbalance are determined quickly by adjusting simple, electrical controls.

Workpiece is rotated at speeds up



Now! Stop Costly Waiting at Tool Crib with McCaskey Tool Control System!

Now . . . newly developed procedures in McCaskey's famous Tool Crib System . . . completely eliminate time lost by highly paid machine operators drawing and returning tools. Crib attendants prepare kits of tools for jobs or operations in advance. Machine operators simply pick them up or they may be delivered to their machines.

Newly designed tool orders are quickly written by crib personnel, by operators at machines or crib or both. Result: No wasted time at tool crib . . . more working time at machines . . . increased machine productivity.

The McCaskey System reduces tool purchases by cutting crib inventories. Reduces tool breakage, loss and theft. Cuts cost so many ways it pays for itself in a few months.

See complete demonstration at ASTE booth 732.

VICTOR

McCASKEY INDUSTRIAL CONTROLS

Production • Inventory • Tools • Maintenance • Costs

Division of

VICTOR ADDING MACHINE CO.

3900 N. ROCKWELL STREET • CHICAGO 18, ILL.

VICTOR-McCASKEY LIMITED
GALT, ONTARIO, CANADA

Manufacturers of Business Machines
Cash Registers, Business and Industrial Sytems
Electronic Equipment, Electri-Cars

Look for the Victor direct factory branch in the Yellow Pages under adding machines, or mail the coupon.

Find Your Nearest Dealer In The Yellow Pages

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McCASKEY INDUSTRIAL DIV., Dept. AM-258.
3900 North Rockwell St., Chicago 18, Illinois

☐ Rush complete details about the new features of the McCaskey System.

☐ Send me your free booklet, "How Tool Costs Were Cut 12 Ways in 20 Plants."

Name .....

Position .....

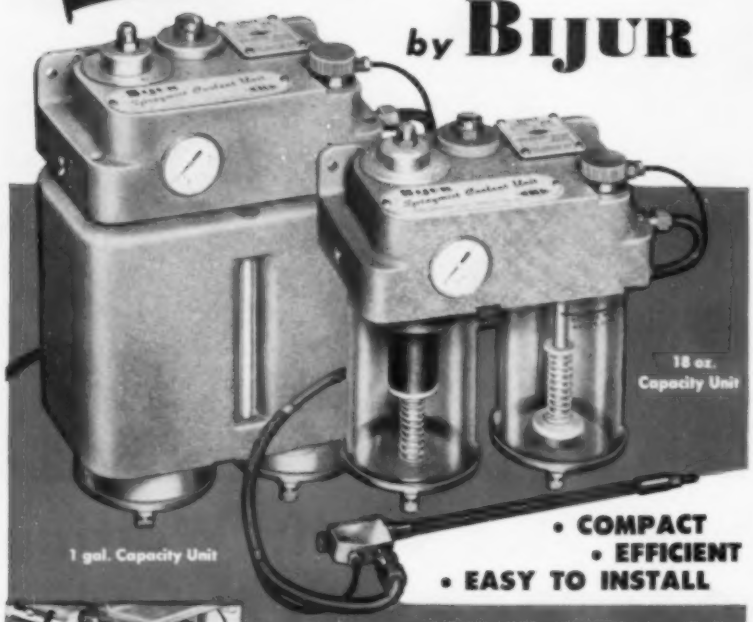
Company .....

Address .....

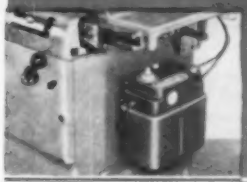
City ..... Zone ..... State .....

NOW... ENGINEERED MIST COOLANT EQUIPMENT!

Spraymist* by BIJUR

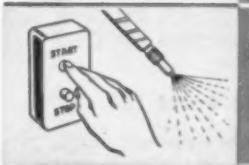


• COMPACT
• EFFICIENT
• EASY TO INSTALL



Compact Integral Unit Design includes built-in air filter, trap, regulator, gauge, solenoid valve, conduit box, pressurized reservoir, and coolant filter. No unsightly plumbing, extra valves or controls!

Individual Jet Control. Precision needle-valve control permits a range of settings from superfine mist to heavy spray. Unique Spraymist design forms the mist *in the jet tip*, not the tube. There's no flooding, sputtering or condensate drip! One Spraymist unit can supply up to 10 or more jets by branching from existing lines.



Automatic Operation saves time and trouble. Solenoid valve, connected to machine circuit, starts Spraymist when machine is turned on. Pressurized reservoir, built-in regulator insures positive air supply, and save shop air. No need for manual air valves!

Extremely Adaptable. Use Spraymist on toolroom and production machines. Standardized components make installation and maintenance *easy*. Choose from 2 reservoir capacities, 3 solenoid ratings, 3 types of jets. Full assortment of hose assemblies and T-blocks for branching. Replaceable jet tips are inexpensive, install in seconds.

SPRAYMIST . . . The modern, compact way to get all the advantages of mist cooling.

Write today for further information!

*Trade Mark

A Product of **BIJUR** LUBRICATING CORPORATION
Rochelle Park, New Jersey

4729

to 3600 rpm by a direct motor drive using a universal joint. Speeds to 36,000 rpm are available with an auxiliary frequency convertor. The machine is reported to feature quick, easy setup for any part within machine capacity. Movement of adjustable work support pedestals positions seismic-mounted vibration pickups. The workpiece is supported by two elastically mounted bearing surfaces, which permit completely free movement of the rotor vertically and horizontally. This permits the part to rotate about its own central axis of inertia, causing it to act as an eccentric. This motion creates vibrations which increase as the eccentricity increases. The mechanical vibrations are transformed into voltages, and are compared in amplitude and phase with a standard voltage. Adjustment of the controls quickly determines position and amount of unbalance.

Machines are available in a wide range of sizes for parts weighing from a few ounces to a ton or more.

Tinius Olsen Testing Machine Co, Easton Rd, Willow Grove, Penna

Self-Setting Snap Gages Offer Wide Measuring Range

Snap gages reading to 0.001 in. are made of mechanite cast steel and have a satin chrome finish. The tools are available with or without engraved scales. Model 300BB (illustrated) has a range of 0-2 in. and sells for $46.50. Model 300EE, 2-5 in., sells for $55.50. The un-engraved models, covering the same ranges, sell for $33.50 and $39.50 respectively. These latter models must be set with size blocks.

Abrasive carboloy nibs provide long life. The Go and No Go members are set individually and tight-

TWO GREAT BEARING DEVELOPMENTS ROLLED INTO ONE!

PLYA-SEAL WIDE INNER RING BALL BEARING

Designed expressly for slow speed applications and wet or dirty operating conditions

New Fafnir Plya-Seal Wide Inner Ring Ball Bearings are a combination of two outstanding bearing developments. The most effective seal ever devised for retention of grease and protection against contamination, plus the famous Fafnir self-locking collar, for cost-cutting, twist-of-the-wrist bearing installation. This combination of features offers you several advantages . . .

Best protection yet against dirt, dust, steam, water, lint, other contaminants on slow to moderate speed applications. Contact-type, Plya-Seals seal out abrasive or corrosive material, seal in factory prepacked lubricant.

Less Maintenance — In many applications, non-relubricatable bearings may be used. They require virtually no maintenance time or expense. In other applications, where bearings receive hard or constant use, relubricatable types are available. They require only occasional greasing, even under severe conditions.

Longer Service life — Plya-Seals protect against premature bearing wear or failure. Contaminants cannot damage balls or races; sealed-in lubricant ensures against bearing "running dry".

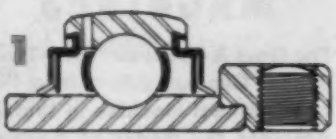
Simplified Designing — Bearing housings may be designed without incorporating separate housing seals. Plya-Seals provide full protection; make possible simplified, less costly, more compact housings.

Power Transmission Units incorporating new Fafnir Plya-Seal Wide Inner Ring Bearing

RAK and RAS Type Pillow Blocks | RCJ Type Flange Cartridges | Fafnir Flangettes

Write for bulletin containing complete specifications on Fafnir Plya-Seal Wide Inner Ring Ball Bearings and Power Transmission Units. The Fafnir Bearing Company, New Britain, Conn.

FAFNIR
BALL BEARINGS
MOST COMPLETE LINE IN AMERICA



PLYA-SEALS

As incorporated in the Fafnir Plya-Seal Wide Inner Ring Ball Bearing, the Fafnir Plya-Seal consists of a synthetic rubber-impregnated fabric sealing washer sandwiched between dished steel plates. Seal flares out, maintaining constant contact with ground outside diameter of inner ring. Years of service have proven Plya-Seals the most effective seal ever developed for ball bearings.

SELF-LOCKING COLLAR

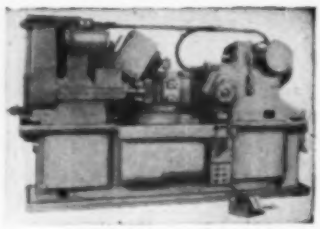
Originated by Fafnir, this famous development has cut costs and simplified assembly throughout industry. Bearings slip onto shaft, are locked securely with simple twist of self-locking collar. No need for lock nuts, shoulders, sleeves, washers, or adapters. Positive binding action increases with use.

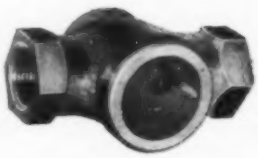
...and parts are finished without rehandling on

GOSS & DeLEEUW AUTOMATIC CHUCKING MACHINES

The Goss & DeLeeuw "One-Two-Three" Chucker differs from the conventional machine in that it provides the means of machining more than one end of a piece in a single handling instead of requiring several handlings and set-ups. A worthwhile gain in production time is assured.

In the "1-2-3", work is gripped in chuck and all ends machined either in sequence or simultaneously. Goss & DeLeeuw and only Goss & DeLeeuw offers this feature in a standard chucking machine.





A few typical parts finished on this machine are shown here. Write for detailed description . . . send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUALITY

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

ened by setscrews. Gages for other ranges are made to order.

Fletch-Aire Co, Inc, Vari-Gage Div, PO Box 1341, Sparta, NJ

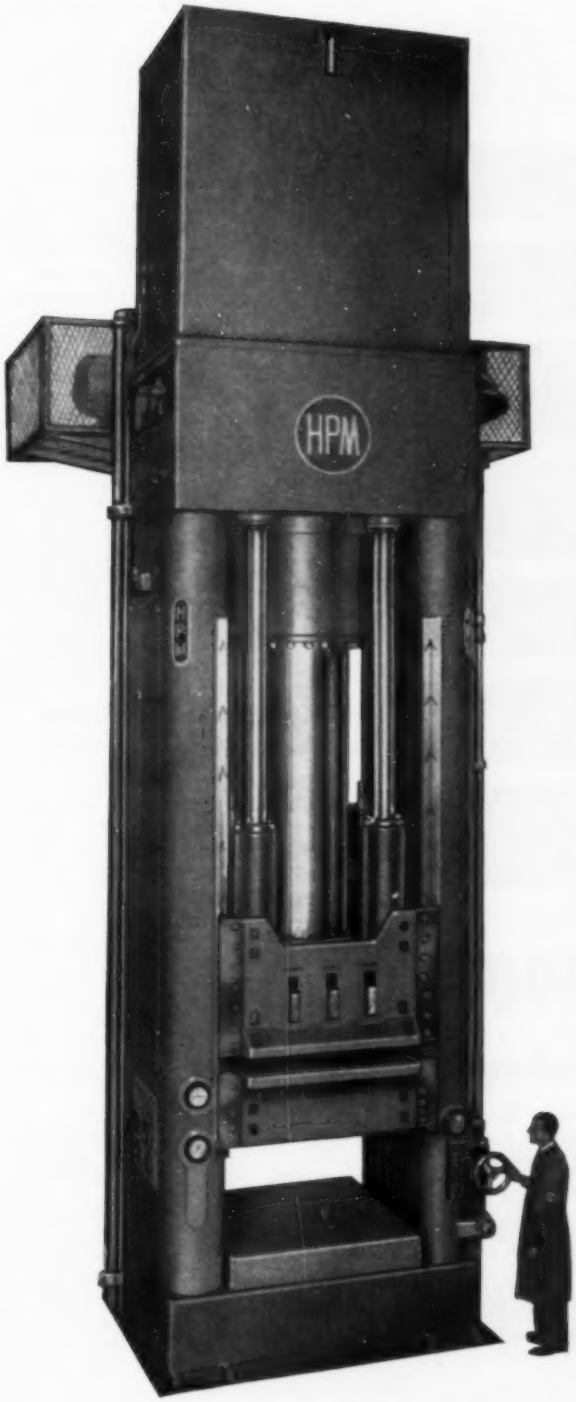
Hyster Cushion-Tired Lift Trucks Offer Short Turning Radius

Space Saver line of lift trucks, available in 6000, 7000 and 8000-lb capacity models, is designed for operation under exacting space conditions. These cushioned-tired trucks feature short turning radius, power steering, a high torque engine, excellent visibility, and "human-engineered" controls and seating arrangement. Oversized, self-adjusting brakes and a two-speed, constant mesh transmission, and low mast height are among the other features of this new line. As optional equipment, the Space Saver line can be equipped with a completely automatic Power Shift Hystamatic Drive unit that provides infinite power ratios for all speed and grade requirements.

Hyster Co, 2902 NE Clackamas St, Portland 8, Ore

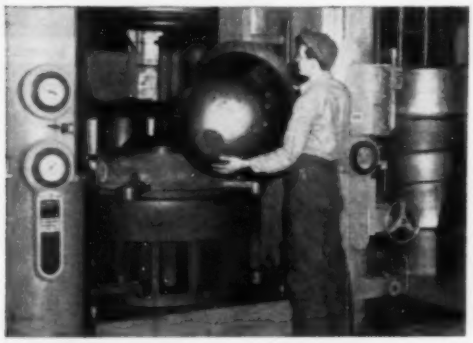
Inside Diameter Gage Measures O-Ring and Snap Ring Grooves

Instrument, said to be capable of repeating to within 0.0001, measures O-Ring, Truarc Ring Grooves, odd grooves, bores, recesses, inside



H-P-M 1000-ton FASTRAVERSE sheet metal drawing press equipped with a 300-ton die cushion and 400-ton blankholder.

50%
REDUCTIONS CUT DRAWING COSTS



"We're Very Pleased With Our H-P-Ms"

Mr. Homer F. Folk, Manager of Pressed Steel Department at A. C. F. Industries, Milton, Pa., reports, "We need an all-around versatile press and our H-P-M can be easily and quickly set-up and regulated for each specific draw job. The accurate control of drawing speed plus total elimination of high impact stresses guarantees proper metal flow and is one of the important factors in making reductions of 50% in one operation possible."

The H-P-M FASTRAVERSE press is infinitely adjustable for a multitude of drawing requirements. Independent control of each hydraulic action provides just the right tonnage for each job. Investigate these versatile all-hydraulic production units. Draw your sheet metal hydraulically. Write today for complete information.

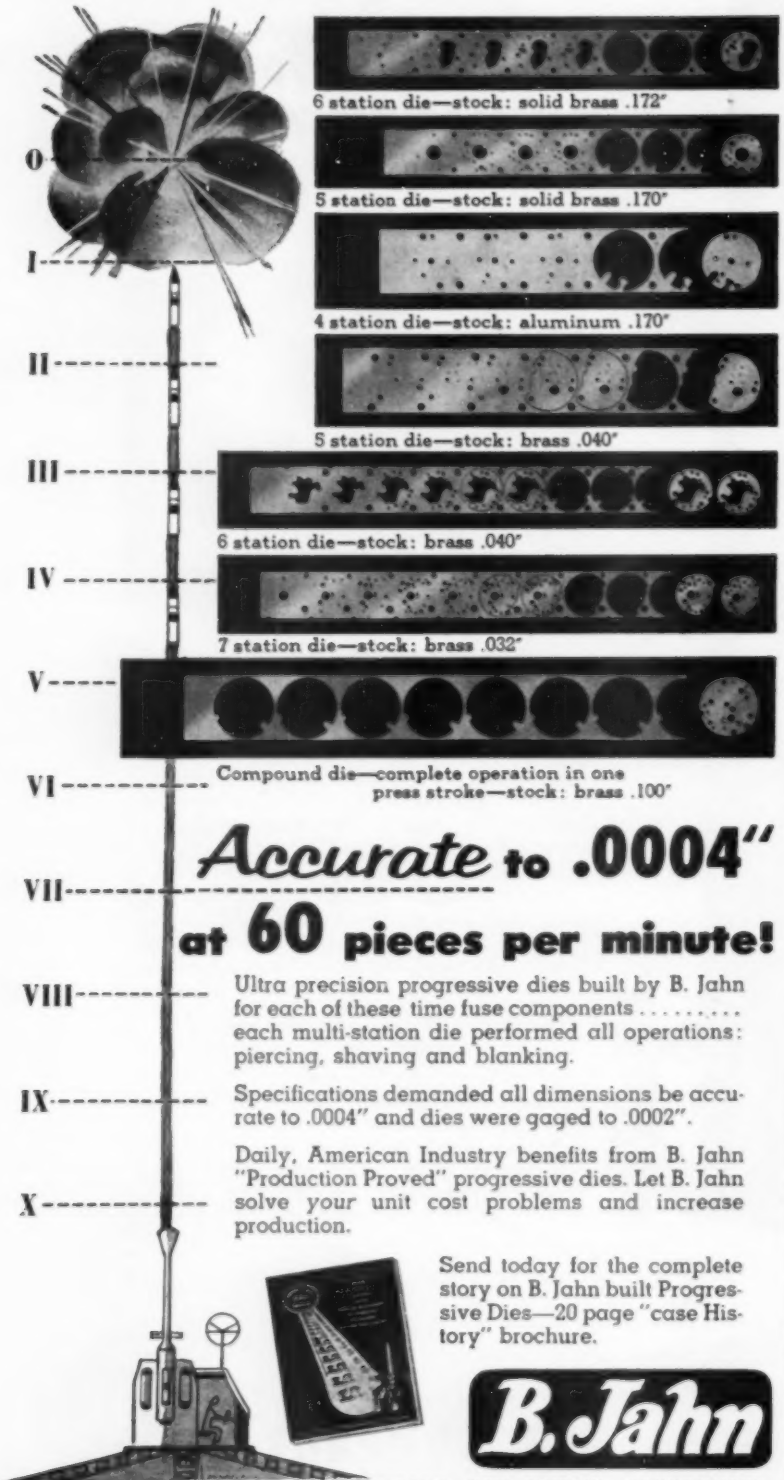
H822

THE HYDRAULIC PRESS MFG. COMPANY

A DIVISION OF KOEHRING COMPANY • MOUNT GILEAD, OHIO, U.S.A.

HPM

TIME FUSE COMPONENTS



Accurate to .0004"

at 60 pieces per minute!

Ultra precision progressive dies built by B. Jahn for each of these time fuse components . . . . . each multi-station die performed all operations: piercing, shaving and blanking.

Specifications demanded all dimensions be accurate to .0004" and dies were gaged to .0002".

Daily, American Industry benefits from B. Jahn "Production Proved" progressive dies. Let B. Jahn solve *your* unit cost problems and increase production.

Send today for the complete story on B. Jahn built Progressive Dies—20 page "case History" brochure.

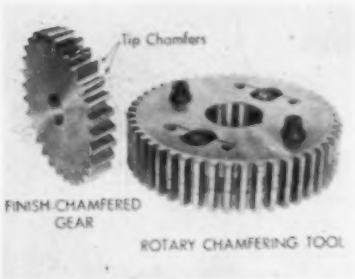
B. Jahn

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

spherical radii, and out-of-round conditions. Measurement range is from 0.187 to 6.875. Tips are designed to measure both O-Rings and Truarc Rings.

Actual measuring is totally independent of any finger pressure; adjustable measuring pressure arrangement is incorporated. Weight of the gage rests on stationary member. Units can also be used for outside dimensions. Bulletin available.

Mueller Laboratory, 1052 N Allen Ave, Pasadena, Calif



Tool Cuts Blended or Straight Chamfers on Tips of Gear Teeth

This Red Ring process for producing profile-blended or straight chamfers on the tips of gear teeth can be applied to any spur or helical gear teeth to provide nick-proof chamfered tip surfaces or to remove burrs left by the cutting process. The specially-designed tool (illustrated) mounts on the spindle of a conventional rotary gear shaving machine and is in mesh with the gear to be chamfered. The chamfering action is performed by reciprocating and rotating the tool while feeding it to tight-mesh depth.

Made in a variety of sizes having curved or angular-shaped tooth forms, the HSS rotary chamfering tool is assembled within a split guide gear. The gear that encases the tool meshes with the gear to be chamfered and acts as a timing or guiding device. The timing gear portion is split so that one-half can be adjusted to provide the desired tooth thickness.

National Broach & Machine Co, 5600 St Jean Ave, Detroit 13, Mich

New Fork-Lift Truck Mast Incorporates Triple Advantages

Tri-Free-Lift mast, now available on all Truck-Man models, combines higher lift with lower down height and a very high free lift.

Available in three lifts, 136½,

THEY *get to take a last look inside*

Standard Oil research develops method for inspecting lubrication of enclosed parts without disassembling

What if you had to make a final inspection of enclosed parts to be sure they were lubricated and you could not do it without disassembling? Standard Oil research scientists have just developed an instrument system that determines lubricant level in an instant. The device measures the density of an assembly so precisely the presence or absence of the desired quantity of lubricant registers on a meter.

Having such a unit might permit you to shorten an assembly line or reorganize assembly operations for greater convenience, speed, economy. The research men at Standard who developed this inspection method will be glad to share their know-how with you to help you fit it to your assembly operations.

This is the research pay-out you get from Standard. This is the "something more" Standard gives to industry besides the research which has established Standard Oil petroleum products as the industry criteria for quality.

For more information about this development or for assistance on other lubrication problems, inquire of any of the 48 Standard Oil district offices in the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.**

You expect more from **STANDARD** *and get it!*

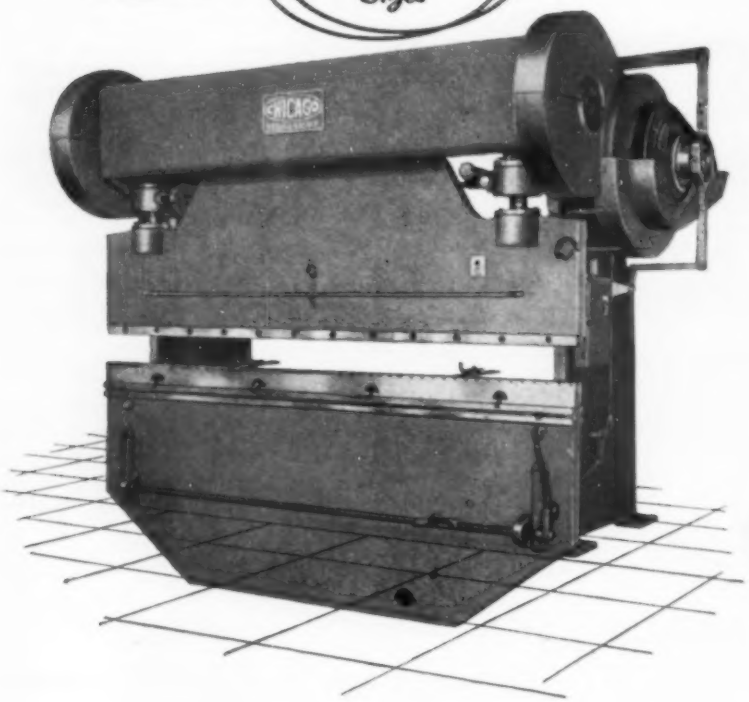
CHICAGO* PRESS BRAKES

for sheet metal and plates

Advanced Design

50 Standard Sizes

Capacities 11 to 450 tons



This is one of the Series D CHICAGO press brakes. It has a bending capacity of 10 feet by ¼ inch—150 tons. Over-all bending length is 12'-2".

Complete recommendations for any job on request.

677

CHICAGO DREIS & KRUMP

Press Brakes • Straight-Side-Type Presses • Press Brake Dies

Hand and Power Bending Brakes • Special Metal-Forming Machines

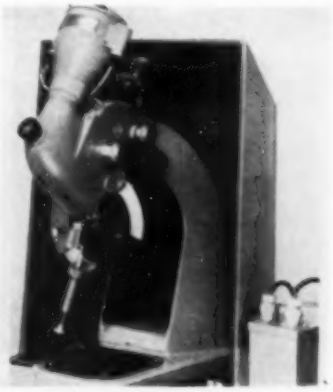
DREIS & KRUMP

MANUFACTURING CO.

7434 South Loomis Boulevard, Chicago 36, Illinois

145½, and 181½ in., masts have respective down heights of 68, 71, and 83 in. On the same mast, max free lift varies from 45½ in. on the 136½-in. lift to 60½ in. on the 181-in. lift. All three heights may be obtained with either 4000, 5000, or 6000-lb capacities (at 24-in. load center).

Truck-Man Trucks, 537 Liberty St, Jackson, Mich



Blade Edge Microscope Checks Turbine Blades

Instrument permits critical checking of leading and trailing edges of turbine and compressor blades, not only their radii, but also the blending of the radii with the flanks of the blade.

Microscope is designed so that it can be used by unskilled operators. Image seen is a normal cross section of the blade which can be compared with master drawing inserted in the drawing holder, permitting simultaneous viewing in the eyepiece. Blades up to 2½ in. wide and as long as desired can be checked with a total magnification of 40X. Special adaptors are available to accommodate vanes.

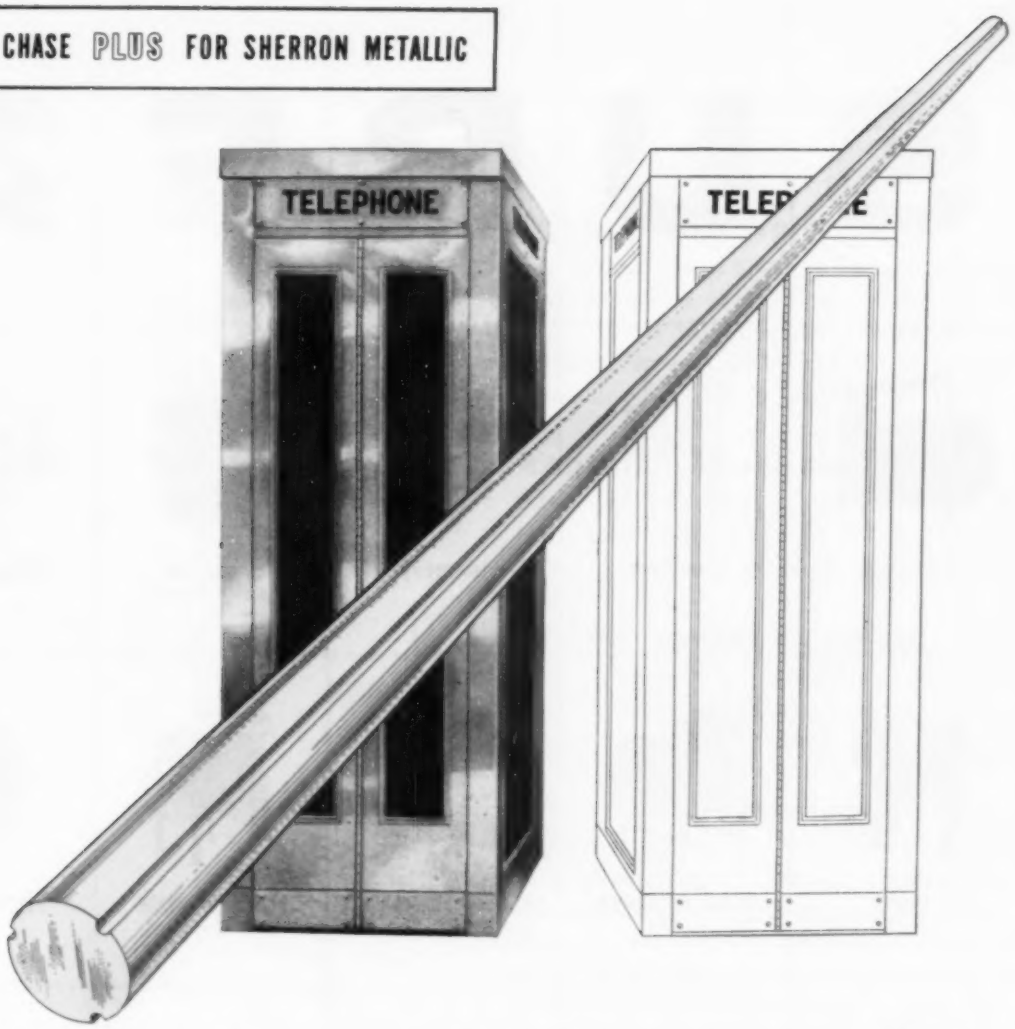
Engis Equipment Co, 431 S Dearborn St, Chicago 5, Ill

Miniature Lubrication System Is Designed for Machine Tools

Low pressure, positive displacement, miniature lubrication system, designated Accumite, is designed for use on machine tools and other machines which have numerous bearings and limited installation space. The heart of the system is a metering valve (slightly larger than a lubrication fitting) which services each bearing individually. System can handle a wide range of lubri-

(Continued on page 184)

THE CHASE PLUS FOR SHERRON METALLIC



Permanent "*silencers*" for noisy phone booth doors

Largest independent maker of telephone booths, Sherron Metallic Corporation came to Chase Brass engineers with a problem. They wanted a 76" long hinge pin for doors on their all-metal outdoor-indoor booths, a pin that had to resist extremes of heat and cold, operate without squeaks, never corrode or bind.

Working with CHASE, Sherron designed a special brass shape with lengthwise grooves, machined to extremely close tolerances. These grooves are packed with a special all-weather lubricant. Installed in the Sherron booth, they give lifetime service without further maintenance.

CHASE engineering can help you solve a problem—either by designing special shapes like this one, or by choosing the *right* alloy for your needs in strip, sheet, rod, tube, or wire by CHASE of Kennecott Copper. Talk over the details of your own specific problem with CHASE—either locally or at Waterbury 20, Connecticut.

You can get the right alloy from ... Chase

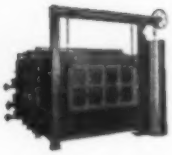
BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT
SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass, Copper and Stainless Steel

Atlanta Baltimore Boston Charlotte Chicago Cincinnati Cleveland Dallas Denver Detroit Grand Rapids Houston Indianapolis Kansas City, Mo. Los Angeles Milwaukee Minneapolis Newark New Orleans New York (Maspeth, L. I.) Philadelphia Pittsburgh Providence Rochester St. Louis San Francisco Seattle Waterbury

SURFA

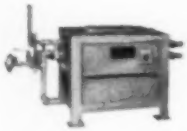


large oven

small oven

laboratory

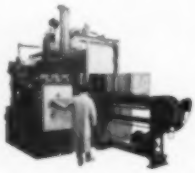
circular pot



rectangular pot

forge

balco® atmosphere



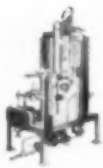
allcase® atmosphere

horizontal muffle

vertical muffle

brazing

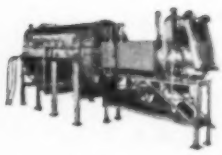
sintering



MRX® atmosphere generator

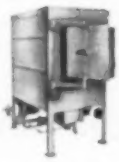
MDX® atmosphere generator

MAX® atmosphere generator



stainless steel

rivet heater



horizontal convection

vertical convection

direct air heaters

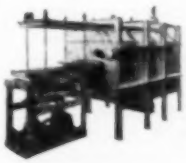
C E

tilting metal melting

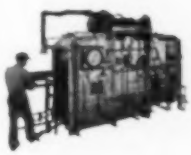
stationary metal melting

soft metal melting

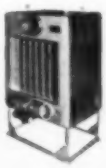
aluminum melting-holding



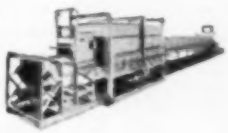
continuous snap hearth



continuous link belt



indirect air heaters



continuous brazing

widest selection

The Surface line of Standard Rated equipment offers a broad range of types and sizes to choose from. Exactly what is needed can be selected. Standard furnaces can be modified to meet the demands of unusual applications.

known production rates

Rated production makes it easy to determine the quantity of finished product which a Surface unit will produce in any given period of time.

known operating costs

Tabulated figures and performance curves on all units clearly indicate in advance the operating cost per pound of finished product.

quick delivery

Surface standardization permits stocking the same parts for many different furnaces. This cuts engineering and procurement time. Surface also offers 80 types and 800 sizes of industrial burners—the same as used on Standard Rated furnaces—for application to your existing furnaces or other requirements.

Write for Bulletin SC-175.

HEAT TREAT, STEEL MILL, GLASS DIVISIONS
SURFACE COMBUSTION CORPORATION
2365 DORR STREET TOLEDO 1, OHIO

Surface®

wherever heat is used in industry

12 AVENUES TO COST REDUCTION

with the "ALSOP METHOD" of

SUB-MICRON FILTRATION

The following cost reductions are substantiated by "in shop" tests:*

1. Increased production
2. Improved finish and controlled accuracy of work pieces
3. Reduction of coolant waste
4. Elimination of systems cleaning
5. Abatement of dermatitis in workers
6. Improved machine cleanliness
7. Prolonged accuracy of tools
8. Longer tool or abrasive wheel life expectancy
9. Reduced wheel loading and wheel dressing
10. Maximum recovery of precious (diamond) swarf
11. Reduced swarf handling and shipping costs
12. Reduction in parts cleaning costs

The "ALSOP METHOD" of sub-micron filtration on coolants, cutting oils and hydraulics is obtained with compact—large area—volume capacity units.

May we have our representative call and discuss a trial demonstration in your plant? No obligation of course.

A request on your letterhead will open these avenues for you.

*Engineering Bulletins on Request

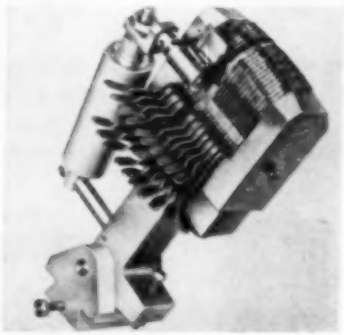
ALSOP ENGINEERING CORPORATION

1302 Liberty St., Milldale, Conn.

cants of the lighter grades.

Four different types of lubricant pumps are available to pressurize the lines and actuate the measuring valves. They deliver enough lubricant to serve from 40 to 200 bearings per stroke. Valves are available in three delivery capacities—0.003, 0.006 and 0.009 cu in. The basic type fits standard threaded bearing ports; snap-on types attach to threaded and drive fittings; and the insert type operates remotely from manifold blocks with tail tubes to bearing inlets.

Stewart-Warner Corp, Alemite Div, 1826 Diversey Pkwy, Chicago 14, Ill



Automatic Numbering Head Marks in a Curved Line

Model 484 is designed for roll marking a 20-digit number into flat pieces with a permanent indented impression in a curved line. Engraving on each wheel is off-center so that the impression is on a curve or radius.

Automatic indexing after each stroke is accomplished by a 1¼-in.-bore air cylinder operated directly from the marking machine cycle. Head is equipped with 20 indexing levers in two banks for manual indexing of all wheels, including those which are also indexed automatically by the air tripper.

Noble & Westbrook Manufacturing Co, East Hartford, Conn

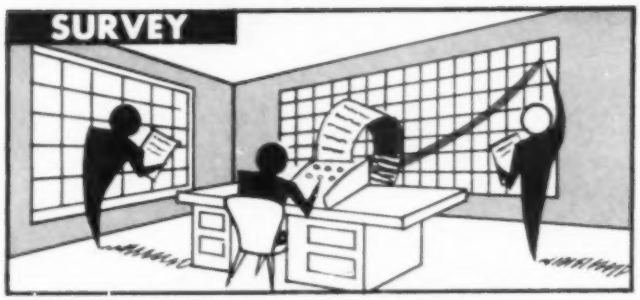
Spiral-fluted end mills, Series 1505, can be run at slower speeds without injury to cutting edge Sixteen individual end mills are available in series. Features include 4 flutes, single end, straight shank, RH spiral and RH cutting. Fractional sizes range from 1/16-in. cutter diameter to ¾-in.; over-all length from 1½ to 4 in.

Atrax Co, 240 Day St, Newington, Conn

TOOL NEWS

carbide

Less than a year ago, a survey of carbide tool users showed that throw-away insert use would triple in five years. Reasons? Industry wants minimum down time, less set up time and no grinding. Users also voted on holder features that would simplify application of throw-away inserts to machining operations.

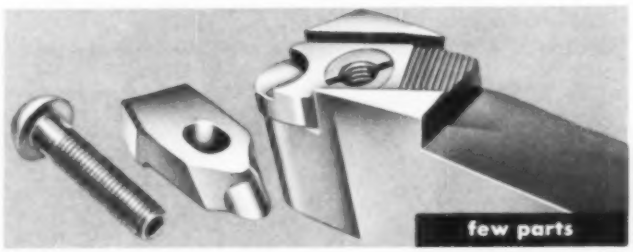


A pioneer in the application of throw-aways, Wesson Company anticipated industry requirements through continuing market research. Wesson developed tool holders with the features desired by industry . . . and a lot more! The full-scale survey showed how right the design is and led to still further improvements in the Multicut holder.

Users Design Holders for Throw-Aways

WHAT USERS WANT

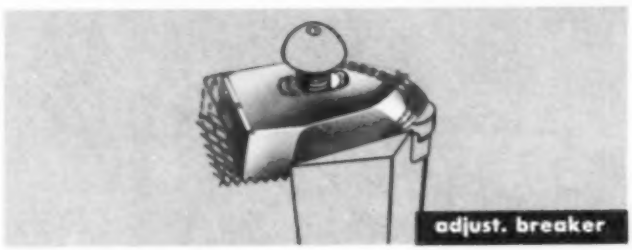
The one thing that all users want is standard parts that can be replaced easily. They want to minimize parts inventory.



WESSON'S ANSWER

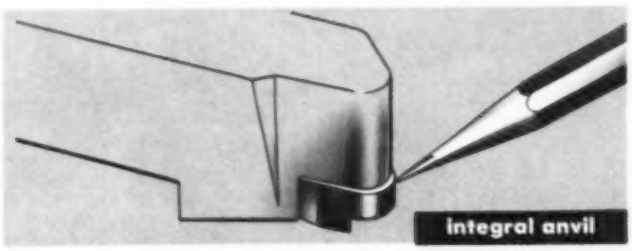
The parts of a Wesson throw-away insert holder are completely standard and interchangeable. Wesson put only *three loose parts* in its holder.

Users want chip breakers with carbide surfaces opposing the chip. They want a chip-breaker clamp that is adjustable to meet specific job requirements.



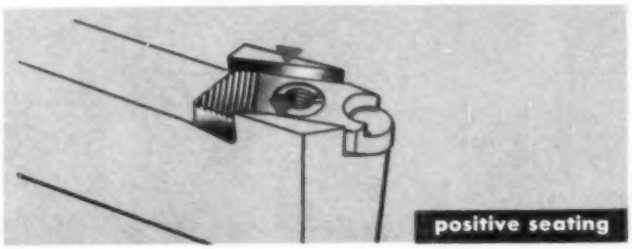
Carbide-faced chip breakers are integral with the clamp and can be adjusted for light, medium or heavy cuts *without interchanging parts.*

Production engineers want a one-piece anvil-locator so they need not worry about dropping it or incorrectly positioning it.

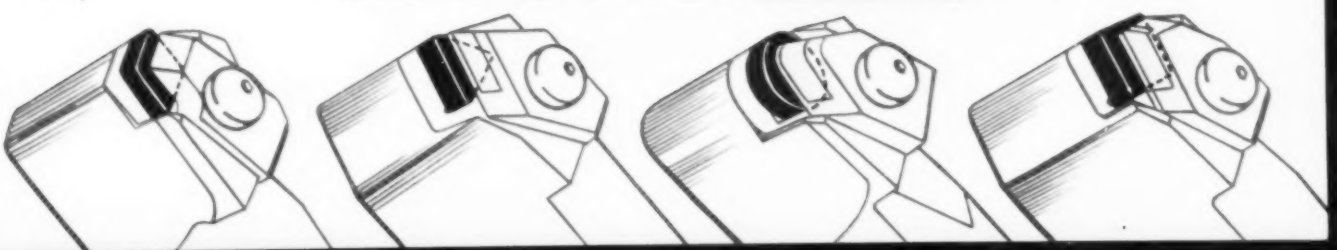


Anvil of the Wesson holders is integral with the locator, bolted to the shank. *It can't drop out.* It is relieved to clear built-up edges too.

Users want to be able to positively adjust holder parts so they will do the job required and stay put. They want to be able to do this easily.



The clamp in Wesson holders cannot be tightened at the wrong angle. It is side-guided and serrated for *positive* location.



TOOL NEWS carbide

Complex Tools Go Throw-Away Too

Industry combines separate operations and separate tools now that multiple-insert designs have revised the limits on complex tools

Multiple-insert tools have all the advantages of single-point throw-aways *and* savings go up geometrically with added numbers of cutting edges.

Tool designers are now free to design the best tooling for a given operation without having to think about how tools can be sharpened. Designers don't have to worry about relocating cutting edges after each sharpening. Inter-related positions of separate cutting edges only have to be set up once.

Rules that apply to conventional tooling don't necessarily hold when inserts are used. For example, a three-bladed boring cutter has always been considered poor design because it was hard to sharpen and set up.

When throw-away inserts are used, these considerations do not apply. Inserts don't have to be sharpened and, when an insert is indexed or replaced, it is in the correct cutting position. No further location is necessary.

Special holders designed by Wesson engineers for use in metalworking are taking on highly complex forms. Users are finding that by using tools designed to combine operations new economies result.

Typical of Wesson-produced tooling that combines operations in a single design are multiple throw-away insert quill-type boring heads, FIG. 1. These heads also include regrindable carbide inserts. They are used for boring, step counterboring and broad facing operations on locomotive bearing housings.

Another example of design innovation made possible by throw-aways is the multiple diameter boring, facing and chamfering head, FIGS. 2 and 3, used in the production of automotive transmission housings. Such a tool would be impractical if fixed cutting edges had to be ground accurately.

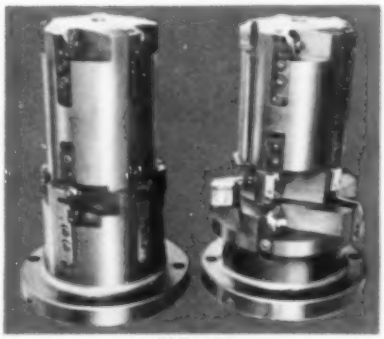


FIG. 1

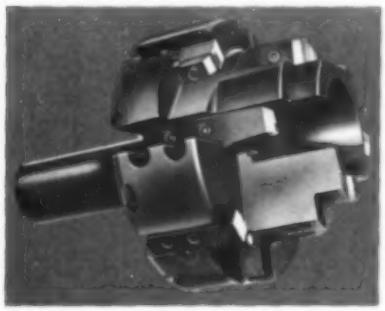


FIG. 2

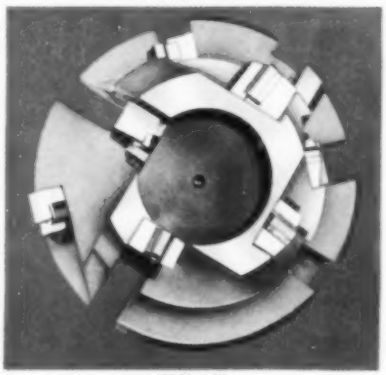


FIG. 3

Impetus is being added to the trend to throw-aways because highly skilled tool grinders are truly vanishing in America. Tool grinding is always costly but, when it is done poorly, costs really soar. To cut costs and improve competitive position, many companies are today tooling entire plants with carbide throw-aways.

Micro-Adjustable Boring Tools

Throw-away insert micro-adjustable boring tools have proved so successful that many special and non-standard designs have been production developed by Wesson engineers. Tools with the micro-adjustable principal save time, improve quality and cut production costs.

Your special boring-tool problem may already have been solved:

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Round Table...

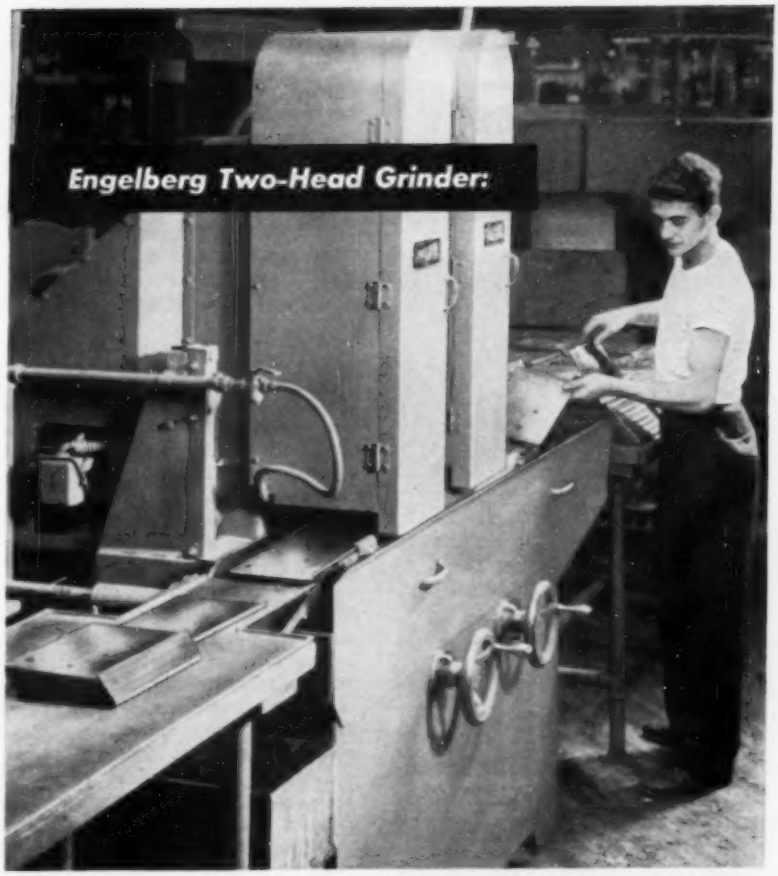
MANAGER OR SUPER MECHANIC?

Does a foreman have to know everything about the equipment in his department—to the extent of being able to repair breakdowns—or should he concentrate on being a skilled administrator?

AL FEELS that he is over-burdened and Ed feels the same way. Discussion between themselves can only accomplish so much. If neither one of them really knows the answer, as it appears, their best bet is to ask the man who knows, the one who hired them. Sometimes the people involved are aware of each other's respective job assignments but because of lack of enforcement measures one employee will take advantage of another and test the limit of a good-natured chap who is willing to handle more than his share of the labor. Such characters will only follow the rule when a third party restates it.

If these men find that they must repeatedly consult someone in order to draw the line, let them sell the idea of a handbook which outlines the work that constitutes the position of a foreman and of the other personnel in the shop. The employment office in any company has a sketch of what everyone should be doing. It wouldn't be difficult to expand this into booklet form so that the men could use it as a guide. They might refer to it when any doubt

"Your time is pretty much your own around here—just be sure you get here before 8 in the morning—and don't leave before 5 in the evening."



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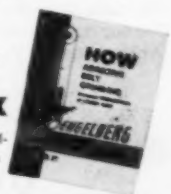

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arises as to what the foreman's work is and what the mechanic's work consists of. The situation with the foreman and the mechanic undoubtedly recurs in every department. For this reason either management or union officials would readily cooperate in issuing a publication of such a description, once they were made aware of the problem.

Perry G. Conway
Philadelphia, Penna

"FORE" IN GOLFING terms means "look out." A foreman then, is someone who looks out for the welfare of his co-workers. Whatever their duties may be, he excels in them. Therefore, he was chosen to act as a guide in his sphere of activities. Theoretically, such an assignment calls for a man with a multitude of skills and talents. Ideally, he should be superman. He should be someone who knows how to effect the slightest mechanical correction. After all, why should a simple machine operator have to make a minor adjustment when there exists someone to assume this responsibility?

He ought to be a gentleman with the tact and finesse of a United Nations delegate because he will be required to please both management and staff workers. (Heaven only knows the frequency and intenseness of such communication.)

The foreman may be expected to be a Goliath with the physical strength of Hercules. A fellow without rank may take time out for a coffee break, but a foreman must be constantly on the go. All agree that his job is difficult, and we know that there is no rest for the weary.

The above picture of a model foreman leaves little to be desired except the actual existence of such a creature in everyday living. A person who would really possess such qualities would be far in advance of the position of a foreman.

Let's face it. A good foreman can strive to teach, and help out, and all of the other things that Al mentions, but to expect him to accomplish all of these feats to perfection is expecting to pour a quart of water out of a cup. By all means let the foreman be the foreman, the guy who is a step ahead of most men in the department, but at the same time disclaiming infallibility in the trade.

Raymon Geraghty
Brooklyn, NY

"One at a time . . . ONE at a time!"

BRAINSTORMING IN THE SHOP

Will lecture sessions to familiarize the workers with the over-all picture of products made in the shop tend to stimulate improvement in quality of production, or bring out new ideas from the men?

DID THOMAS EDISON or Benjamin Franklin go to college? Of course they didn't! Their native intelligence kept them so busy following through on their practical ideas and inventions that a higher education wasn't necessary for their advancement. Had they spent four or five years studying at a university, we might have been without four or five years worth of valuable ideas because their rate of turnout was extremely high.

It is true that our chances for new ideas multiply as our knowledge is increased, but there is only so much that time permits us to carry on in a practical way. Special training for the men in the shop has a good objective, as Malone implies, but it hardly seems worth while. If a man is going to get some bright ideas about his work he will get them, regardless of the additional classes.

There is such a thing as an "inventive mind." A man doesn't all of a sudden dream of a better mouse trap. He directs his thinking toward the improvement of anything that can possibly be changed. He hardly needs instruction to be brought to him at the expense of everyone in the shop. He is the type who goes after the information on his own. That is part of his makeup, just as it is part of a mother's nature to look after her children. He doesn't have to have the formal training of an engineer. If a man is going to put his head to work to get bright ideas, he doesn't have to be coached

"When lathes jam... *look out!*"

"Production engineers who specify or influence the purchase of metalworking lathes for industry know that jamming of a lathe carriage or tool by an inexperienced operator can cause costly gear breakage and flying metal."

"But it *does* happen. A man turns around—takes his eyes off the work for a moment—and wham! Production, profits—even "firm" delivery dates—can get as jammed-up as the gears on that lathe.

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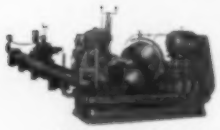

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to do it. Indeed, if he is the kind who will improve something on which he is working, he is the kind who will not be found among the ranks for a very long period of time. Either he will take the initiative or go into business on his own.

It might be more to a company's advantage to offer to back the tuition cost of individuals who wish to attend outside courses along the lines of the type that Malone is running. That way no one's time is wasted because anyone who is willing to take a little extra trouble to apply for such a privilege is bound to be worthy of it.

Joseph McLaughlin
Rockaway Beach, NY

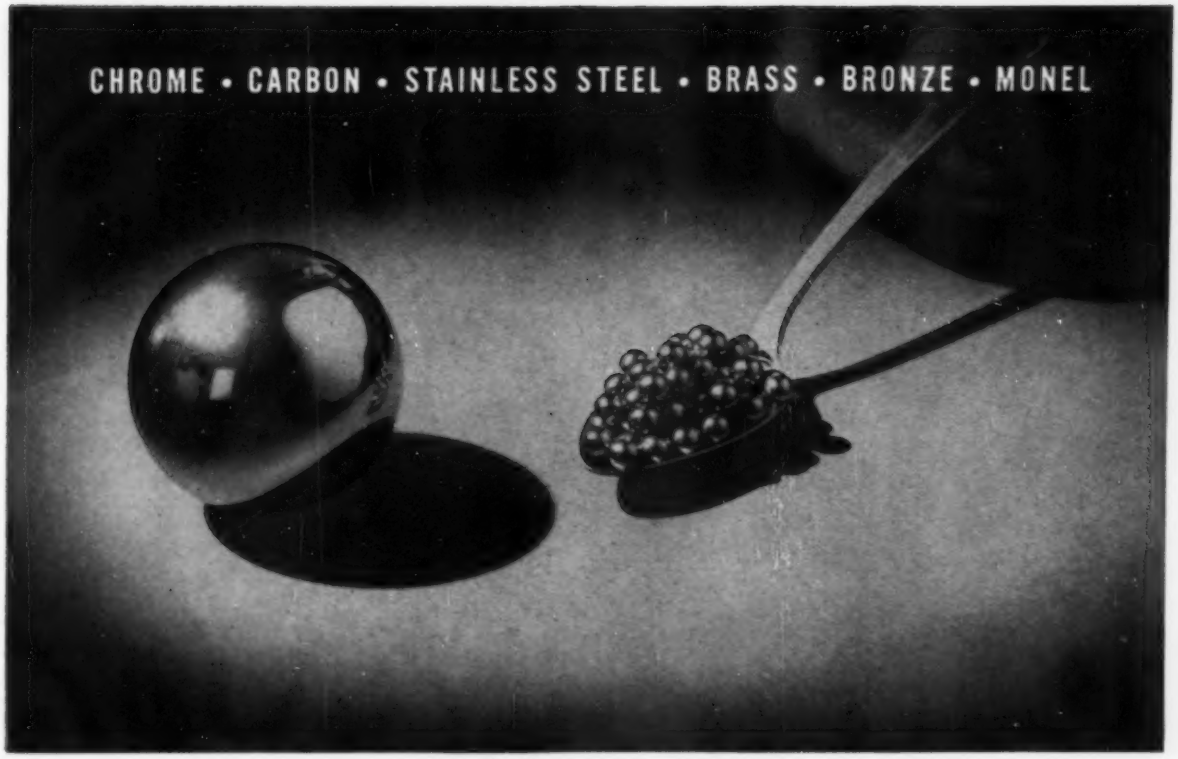
KEY-MAN BONUS PLAN

Can a fair bonus system be worked out for foremen that would spur production, but not at the expense of neglected equipment, or driving the workers?

BONUSES ARE an effective method of increasing production. A properly applied wage incentive plan will reduce unit costs and raise output. These plans have been used for years for production workers and have generally been successful. There are many industries where incentive plans are the rule rather than the exception. There are a variety of methods of applying them, depending on the type of work and the company policy. There are individual plans as well as group and department bonus plans.

The bonus plan as we know it today has not been widely applied to

"What a night . . . I dreamt I was at the shop running all the machines by myself." . . .



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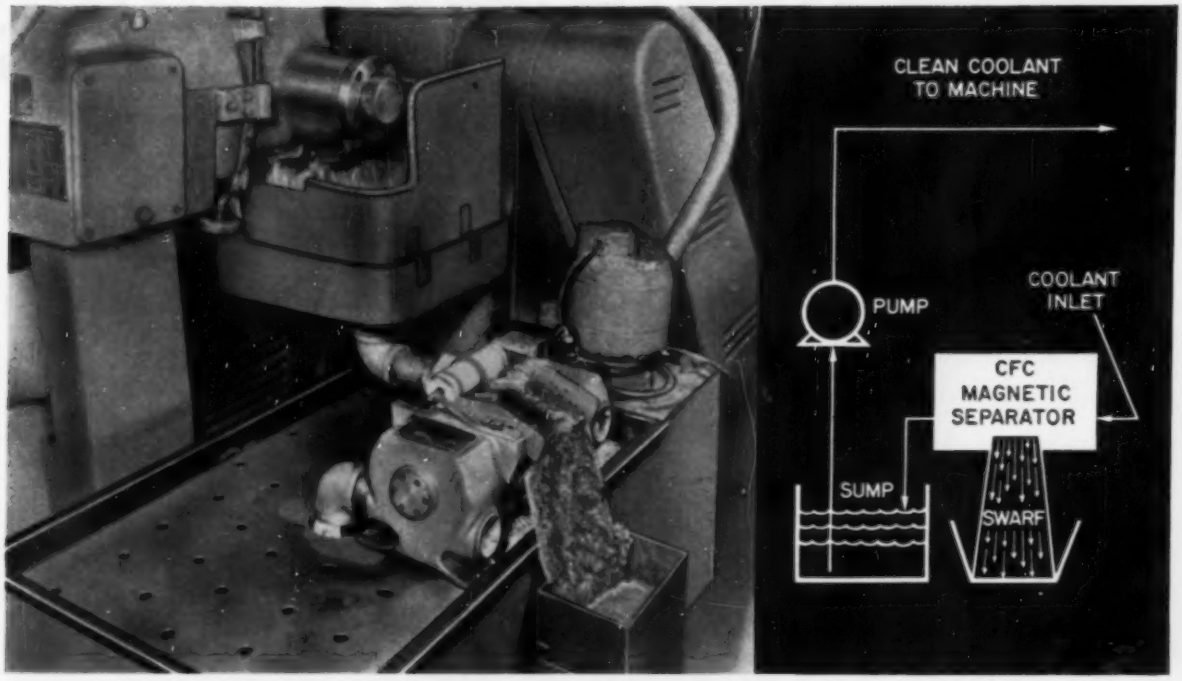
cover foremen and supervisory workers. It is likely that this distinction has been perpetrated to maintain the divorced condition between foremen and production workers.

Failure to include foremen in an incentive plan creates a troublesome disparity in the approach to the job. For this and other reasons the foreman should be included in an incentive plan. Establishing such a plan requires a great deal of investigation, preparation, and study. It is essential that the plan be equitable so that each foreman will enjoy approximately equal opportunity to earn a bonus. This preliminary study must be made sufficiently broad to include all pertinent factors. It should cover the intangible as well as the readily measurable tangible factors. Safety records which usually show a tendency to deteriorate under the incentive plan must be considered. A supervisor does not deserve a bonus if he increases production but accompanies it by a disproportionate rise in accidents. Since the foreman's bonus is determined by the output of the department, an incentive plan which includes the foreman creates an improved group spirit. It results in a feeling of partnership and makes each department a close-knit, cooperative team. These desirable feelings can be further propagated by creating a spirit of interdepartment competition.

Since the foremen are part of the management team the entire program of incentives should be discussed with them before it is finalized. This will result in a better plan and one in which they will take a greater interest for they will feel

(Continued on page 193)

"I want Fenton to start at the bottom, so I'm putting him in charge of this department."



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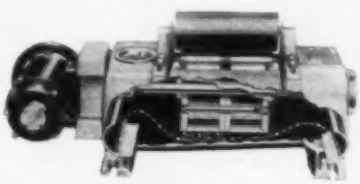

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- ☐ "Spec" chart for Walsh Presses—Bulletin ES102
- ☐ Features of Walsh Punch Presses—Bulletin 304
- ☐ Care and maintenance of Walsh S-I or S-I-A two button safety and non-repeat devices—Bulletin 304

NAME.....

ADDRESS.....

CITY.....STATE.....

WALSH PRESS & DIE COMPANY

4709 WEST KINZIE STREET • CHICAGO 44, ILLINOIS • ESTebrook 8-6700

they contributed their ideas toward it.

There is a real danger that an incentive plan may result in a dereliction of duty on the part of the foreman. He may permit quality to decline and neglect housekeeping and maintenance. Measures must be taken to prevent a reduced regard for these essential spheres of duty. The plan should be spelled out in sufficient detail to prevent bonus payments at the expense of these functions. There are many shop operations where output can be increased by less economical use of raw materials and supplies. For example, hand files and abrasive belts may be discarded before the economical replacement point is reached in an effort to increase output. Detection of these methods of earning a bonus requires constant study and investigation.

A bonus plan for supervisors embodies many advantages but like most good things the advantages are not available without effort. When properly set up and operated with the necessary care and diligence such a plan can prove to be a real profit-maker for the plant.

Ernest Jones
Bronx, NY

HOLD BACK THE PAY

Can a company legitimately hold back a man's first week's pay as a form of security for both parties? Even if it is restored when a man leaves, will it cause resentment and misunderstanding among the workers?

WHEN WE WERE CHILDREN there were times when our parents would keep our allowance from us, but that was only as a form of punishment after

"Hasse caught his finger in the cigarette machine, Carp choked on a cookie, Walter stubbed his toe on a beverage box, and Arnold spilled hot coffee on his lap!"

Six machines protected from dust by Torit for **$666.15**

This Torit Dust Collector, Model 219FM, was installed by the Mohr Lino Saw Co., Skokie, Ill., to protect 3 belt sanders and 3 other grinders (2 grinders hidden from view) from destructive dust. Total cost of collector *plus* all accessories was an astonishingly low $666.15!

After one year's operation, Mohr Lino Saw says this about their *low-cost* Torit installation: "Our Torit installation has proved efficient and economical—an excellent investment because it has kept our shop *cleaner*, our operators *happy*, and *protected vital* machinery."

Just as Mohr Lino Saw Co. did, you can achieve greater machine protection and cleaner working conditions by trapping dangerous or valuable dust *at its source* with a completely *self contained* and *portable* Torit Dust Collector. For full details on Torit's complete range of types and sizes, write to . . .

TORIT MANUFACTURING CO.
Dept. 406, 311 Walnut Street, St. Paul 2, Minn.

Make accurate set-ups *faster* with this
25° Tilting Spindle

The STERLING Model "G-2" Universal Tool and Cutter Grinder provides this extra feature plus complete versatility and more capacity than comparable machines at *lower cost.*

Swing 10¾" over table, 27" between centers, 18" table travel with 8¼" cross feed. For complete details and specifications write for FREE Bulletin "G-2".

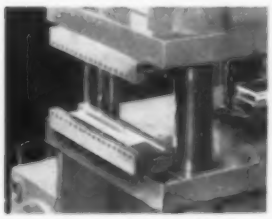
Grind 90° to 140°
Included Angle on *ALL DRILLS*, ⅛" to 2½"

No collets or chucks makes set-ups easy. Clearance gauge insures accurate, positive clearance angle. True conical grinding produces full clearance from center to outside. Write for FREE Bulletin "DV-1".

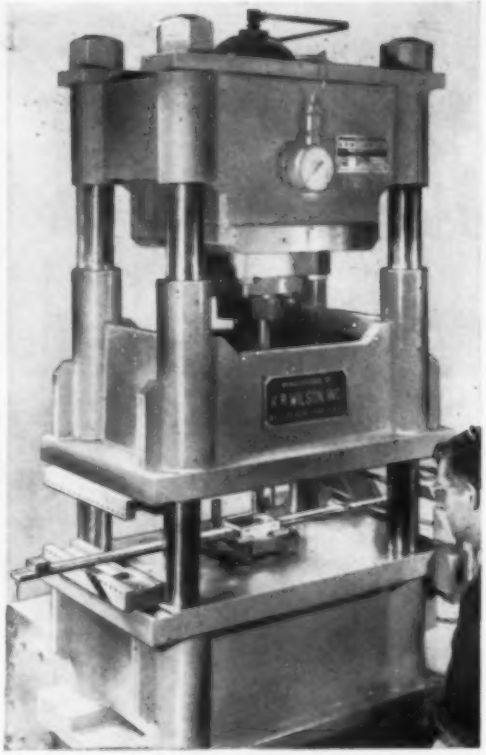
McDONOUGH MFG. CO.
1526 GALLOWAY • EAU CLAIRE, WISC.

Case History No. 12

E. H. Titchener & Co.
Binghamton, N.Y.



This close-up shows how the E. H. Titchener & Co. uses the 3" x 24" slide and platen outboards to install breaking dies and use them without affecting the normal working area of the press.



VERSATILE, MULTI-PURPOSE PRESS SOLVES PROBLEM FOR E. H. TITCHENER & CO.

"Give us a die tryout press which incorporates critical tolerances, provides a wide range of versatility and, if possible, build it to be used for die development and die tryout simultaneously on various units that are independent of each other." This was the problem the E. H. Titchener & Co. gave to R. C. Neal Company, Inc., Wilson's Elmira, N. Y. Dealer. Working closely with Earl H. Kaeselau, Wilson's New York State representative, K. R. Wilson engineers developed and produced this 100 ton capacity down acting, four column hydraulic press designated Model 100S-FM-2424.

In the development of this press, K. R. Wilson engineers came up with this unique feature — 3" x 24" slide and platen outboards were added which permits the Titchener Co. auxiliary working area where conventional tools can be installed and used without affecting the normal work area of the press. This feature makes the press truly versatile, a real multi-purpose press for a wide variety of uses.

SPECIFICATIONS

This press is available in 25 to 500 ton capacity and can be modified to customer's specific requirements.

If you seek a sure, successful solution to a specialized press problem, follow the lead of America's most progressive companies, contact your nearest K. R. Wilson representative, or write direct today.

HYDRAULICS DIVISION

K. R. WILSON, Inc.

Offices & Factories – 210 Main St., Arcade, N.Y., U.S.A.

we had done something wrong. Men who have their pay held back on them are not children nor have they done anything wrong. A company has enough gall to be cut into three parts when it assumes that it can protect itself from an untrustworthy employee by holding back the first pay check from every new man. Why penalize all for the sake of a few?

If missing tools have become such a problem that the boss finds it alarming, he should do something more constructive about it. The answer to the difficulty is insurance. It can be taken out on everything from rain to furniture and it usually is. It doesn't seem unreasonable then to insure a factory against the consequences of a novice who is a fly-by-nighter. Such an investment would doubtlessly lessen the chances of employing men who would be prone to leaving a boss in the lurch.

An insurance company, before undertaking a contract, would investigate in a scientific manner the reason for such behavior as is found in this shop. They would first find out why a notable number of men leave abruptly and they would try to do something about it. A good insurance company would minimize the cause in order to lessen the evil effect. If it is successful enough in curing the ailment, insurance could be eliminated in time or at least kept down to a very small policy. There are many ways of catching flies (or fly-by-nighters). In this case honey (sometimes called money) is the best means but it must be handled with discerning judgment.

Perry G Conway
Philadelphia, Penna

"Don't pay any attention to him; he's ninety percent water, even as you and I ——"

With this Kodak Contour Projector Auburn Plastics, Inc., accurately gages a great variety of parts down to .001". Operator can easily measure angular dimensions on cams and keys, threaded mold components, center-to-center dimensions on parts and tools.

How many gages to inspect these parts?

Just one—if it's a Kodak Contour Projector.

Auburn Plastics, Inc., of Auburn, N. Y., a venerable custom molder, produces a wide variety of component parts for various manufacturers. Formerly this firm needed many mechanical gages to make necessary quality control checks.

A *Kodak Contour Projector* eliminated the expense of buying such gages—amounting in *one instance to a saving* of *$5,000.*

In a fiercely competitive business, Auburn Plastics, Inc., can submit *lower* bids because of savings permitted by *optical gaging.* The company effects additional economies by using its Kodak Contour Projector to inspect *tools* and *dies* as well as manufactured components. In all cases the projector permits gaging of angles, radii, holes and other dimensions—at a glance.

If you have an inspection problem involving myriad small parts, you can do the job easily and inexpensively with a Kodak Contour Projector. Inspection is a matter of comparing the projected image of the part with a chart gage on the screen. You inspect different types of parts simply by changing chart gages. Operators need little training.

For additional information or to arrange for a demonstration of any of the 6 Kodak Contour Projector models, write to:

Apparatus and Optical Division

EASTMAN KODAK COMPANY, Rochester 4, N. Y.

the KODAK CONTOUR PROJECTOR

Kodak
TRADE MARK

WHEN SMALL PARTS GET

SMALLER

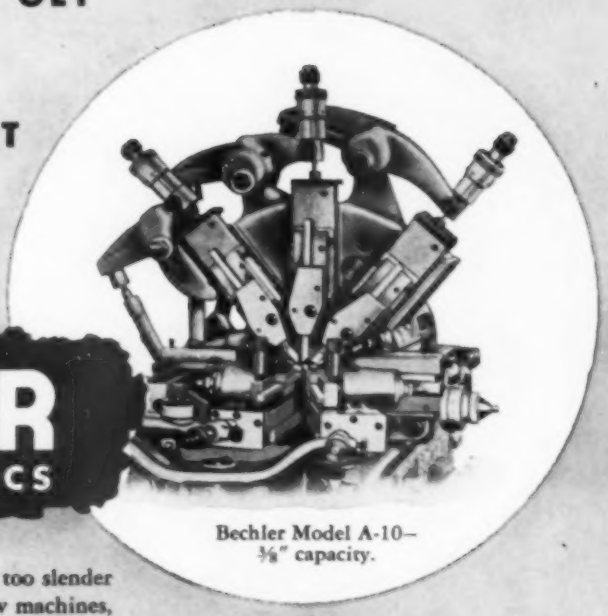
AND TOLERANCES GET

CLOSER

YOU NEED . . .

BECHLER

SWISS AUTOMATICS



Bechler Model A-10—
⅜" capacity.

When tolerances are too tight, and parts are too slender or intricate to be produced on ordinary screw machines, then Bechler genuine Swiss Automatics are probably what you need. Fifty years of experience have made Bechler the leading builders of Swiss type Automatics—and BECHLERS are SWISS-MADE.

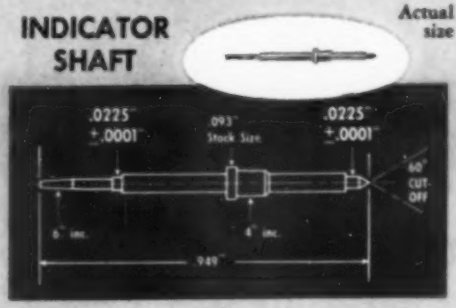
Bechlers do the job quickly, accurately, uniformly, and with exceptionally high finish. Five tool slides, with single-point tools, can be individually adjusted with micrometer screws. The two horizontal slides of the double tool attachment are used for undercutting and burnishing. Different models are available with capacities up to 1¼" diameter and 9" turning length.

Get in touch with us soon. Find out how Bechler can help you make better products to meet and beat higher and higher standards.

- **Service centers in New York and Los Angeles—factory trained men will plan layouts, produce tools, cams, and make set-ups.**
- **Complete stock of attachments, spare parts, and cams.**

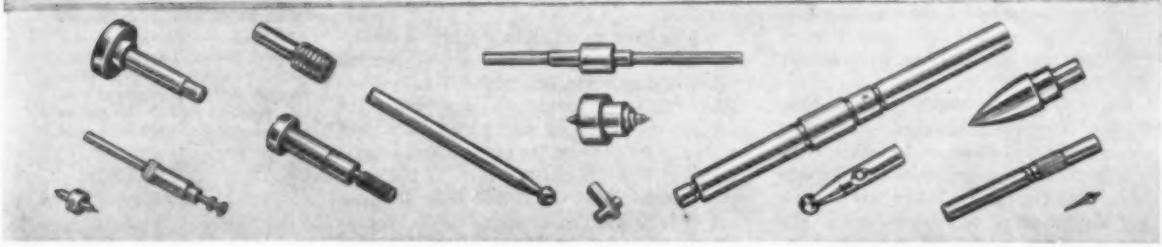
INDICATOR SHAFT

Actual size



material	stainless steel, type 303
precision	bearing diameters held to ± .0001"
finish on bearing surfaces	6 MIRMS
production time	30 seconds per piece
machine	Bechler, Model A-10

The Bechler Model A-10 can produce many different precision parts up to ⅜" dia., 2¾" long. Here are just a few, actual size:



COSA — *nationwide sales and service of precision machine tools—from bench lathes to boring mills.*

COSA CORPORATION, 405 LEXINGTON AVENUE, NEW YORK 17, N. Y.

IN CANADA contact COSA CORPORATION OF CANADA, LTD., 1160 Lakeshore Road, Long Branch, Toronto 14, Ontario

Protect Hydraulic Systems 3 Ways

...WITH SINCLAIR DURO HYDRAULIC OILS

1. STOP RUST!

You stop rust everywhere in your hydraulic system with Sinclair DURO Oils! Water in the system can't reach metal surfaces because Sinclair's rust inhibitor is a preferential *metal-wetting* agent that plates out on surfaces, and stops moisture-to-metal contact.

2. FIGHT OXIDATION!

Two special inhibitors in DURO Oils give you extra protection against oxidation of the oil, and prevent the formation of oxidation by-products. Thus, your hydraulic system stays free of varnish, sludge and corrosive acid . . . highly important in today's advanced equipment!

3. PROTECT AGAINST FOAMING!

Sinclair adds a highly effective anti-foam agent to DURO Oils. This keeps air bubbles from being retained in suspension, thus assuring positive control and continuous lubrication with less wear. Sinclair DURO Oils give you smoother, *full power* transmission!

Look to the "big three" benefits of Sinclair DURO, the high viscosity index oils for hydraulic systems . . . they're designed to give you the maximum performance at the higher temperatures, greater pressures, and faster speeds of modern hydraulic systems. Your Sinclair Representative can give you full information, or you can write for literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. *There's no obligation!*

SINCLAIR

DURO HYDRAULIC OILS

For any counting problem...

your Veeder-Root Distributor has a ready "stock answer"

Counting problems and counter applications vary as widely as words in the dictionary. But there's one place where *all* these problems can be met and solved, quickly and at low cost.

That place is the stockroom of your Veeder-Root Distributor. There on his shelves, in the bright red, white and blue packages, are the basic Veeder-Root electrical and mechanical counters that can be adapted to machines and processes in every industry from automotive to zinc die-casting.

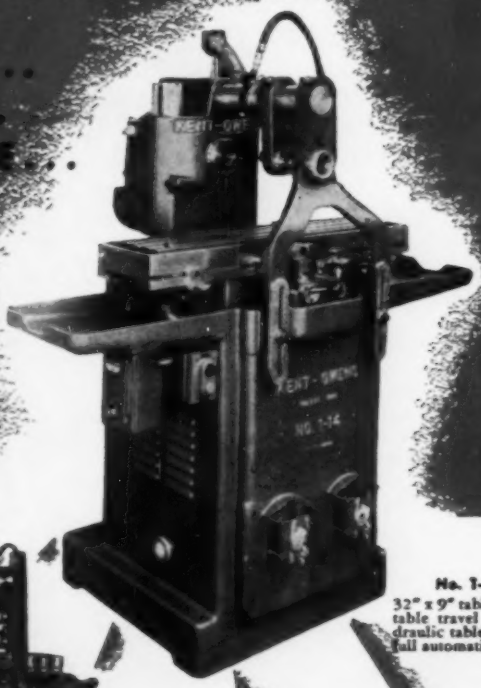
Sounds like a "big order." Just try him with an order and see for yourself!
For your nearest distributor, write D. G. Dresser, Veeder-Root Inc., Hartford 2, Connecticut.

Count on VEEDER-ROOT
to help you build business with Mechanical, Electrical & Hand Counters for every industrial application

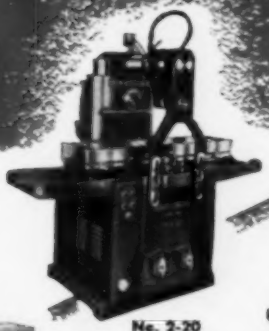
Everyone can count on
VEEDER-ROOT
"The Name that Counts"
Hartford 2, Connecticut

EXTRA RUGGED... SPEEDY... ACCURATE...

to Bring Down Milling Costs!

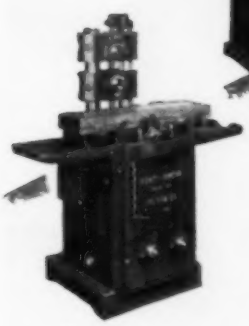


No. 1-14
32" x 9" table ... 14" table travel ... hydraulic table feed ... full automatic cycle.



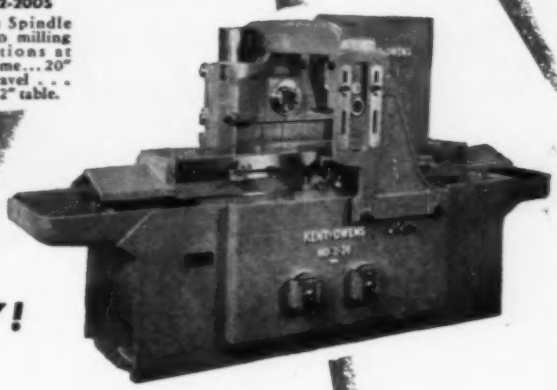
No. 2-20
20" table travel... 42" x 12" table... fully automatic hydraulic table feed.

No. 2-20DS
Double Spindle for two milling operations at same time... 20" table travel ... 42" x 12" table.



No. 1-14DS
Double Spindle for two milling operations at same time ... 14" table travel ... 32" x 9" table.

No. 2-20V
20" table travel... vertical spindle with speed range 32 to 1284 R.P.M. ... 42" x 12" table.



No. 3-36 ... 36" table travel ... 64" x 16" table ... full automatic hydraulic feed.

STEP UP SPEED and ACCURACY!

Put the work on Kent-Owens Machines for top-speed milling and topmost accuracy to keep your costs at a minimum! Advanced features throughout these rugged machines make the difference ... greater dependability ... accuracy maintained in meeting tough production schedules. Twin-post head mounting assures balanced load. Greater cutting efficiency—only two gear contacts, motor to spindle. Write for bulletin #754 on wide range of hydraulic and hand-operated machines. Also, let Kent-Owens design and build your tooling and special machines. Kent-Owens Machine Co., Toledo, O.

KENT-OWENS
for milling machines

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Costs up to 35% less to buy than other lightweight tooling metals

Here's why Dow magnesium tooling plate costs less to buy. The fundamental characteristics of magnesium permit rolling and oven thermal flattening to a degree of flatness and surface smoothness satisfactory for virtually all tooling uses. This flatness is not obtainable in other lightweight tooling materials without costly machining of the surface.

You save on fabrication costs, too. Magnesium's unsurpassed machinability saves time, effort and wear. Magnesium's lightness makes tools easier to handle during fabrication and use. Remember—magnesium COSTS LESS TO BUY, COSTS LESS TO FABRICATE, COSTS LESS TO USE!

Ask your Dow magnesium supplier for the complete story. Contact him today or write THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. MA 1427C.

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Vinson Steel and Aluminum Company, Dallas, Texas

YOU CAN DEPEND ON DOW

How one precise adjustment started a new era in stamped metal production

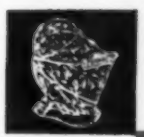
It was back in 1954. A group of Wean Equipment Corporation executives and engineers were gathered around a bench-size prototype of an idea; an idea for a new kind of stamping press so revolutionary that it was decided to build a scale model embodying the principle before any development work was done on full-size equipment.

The group watched the Wean research director who had conceived and built the model make a careful final check; involuntarily held its breath while the switch was thrown. Nothing happened. In the short silence that followed no one moved . . . until, with a muttered comment, the research director directed one sharp blow at the side frame of the model with a lead hammer lying nearby.

The resulting clatter of the press, galvanized into action by this unexpected persuasion, heralded a new era in metalworking. For the "Flying Press" principle was first proved practical in that bench model; has been proved time and again in production size presses of from 20 to 300 ton capacity installed in forward-looking stamping plants.

We say "new era" because the "Flying Press" permits metal to be stamped and formed from coil without stationary indexing of the strip as it passes through the press. This continuous, uniform motion of metal through the "Flying Press" results in higher parts production from the same dies used in ordinary presses. But perhaps more importantly for the future, the "Flying Press" principle is unique, in that it matches press operation to the continuous-flow production techniques necessary for automated operations.

If you use stamping presses, you should know about this unique development that permits speeds never before possible while offering tooling protection, reduced die maintenance, and vastly reduced press maintenance requirements. There are too many other advantages of the Wean "Flying Press" to discuss here, but we've summarized them in a brochure. We'll be glad to send you this literature on request.



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Standard Resistance Welding Electrodes...

Why order special electrodes or make your own? Save time and costs by ordering standard Mallory resistance welding electrodes from your Mallory distributor. He can supply the exact type and size you need from stock . . . for immediate delivery . . . at substantial savings.

You can choose from an exceptionally complete line of in-stock electrodes:

113 different straight electrodes . . . with pointed, dome, flat, offset, radius or cone tip . . . in several different Mallory alloys.

- **30** different Elkonite®-faced electrodes with dome, flat or center insert tips
- **10** different socket type electrodes
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- **51** different irregular-shape electrodes, including many designs you may have considered "special order".

Many models can be supplied with the exclusive Mallory fluted cooling hole that greatly prolongs electrode life. Whatever your choice, you can expect long, efficient service, because these electrodes are precision-made from special Mallory alloys.

Ask your nearby Mallory distributor for expert assistance in electrode selection.

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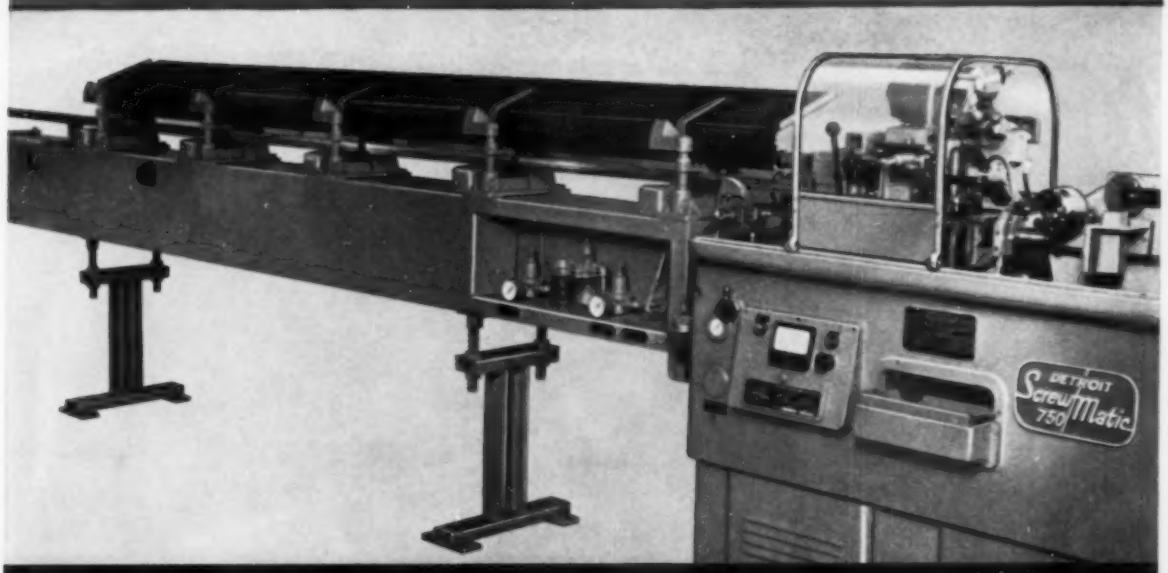
NOW: an automatic bar feed for Screwmatic 750's



NEW LOAD MECHANISM BOOSTS VOLUME OUTPUT, ELIMINATES FEED FINGERS AND MANUAL LOADING, HOLDS UP TO 8-HOUR SUPPLY OF BARS, RODS OR TUBING

Add a Lipe A.M.L. Bar Feed to a Detroit Screwmatic 750. The result: up to double your present production. Air-operated, fully automatic Lipe Magazine-Loading Bar Feeds are now available on, or for, all Screwmatic 750's.

Here are a few outstanding advantages provided by this new inter-company agreement:

- Far greater volume per machine
- Automatic load and feed to a predetermined stop
- Pneumatic control which does away with feed fingers and manual loading, reduces operator fatigue
- Designed to hold plus or minus .001" tolerances
- Single stock supply lasts over a normal 8-hour shift

In addition the new Screwmatic 750 features unique "unit construction"—the design which cuts the cost of absolesence, down-time and maintenance. For full information about how the Detroit Screwmatic 750 Bar Automatic can now offer your shop greatly increased, continuous production at less cost: write today for your free copy of the 1958 Detroit Screwmatic 750 Catalog.

585M-A

THE GEAR GRINDING MACHINE COMPANY

3919 Christopher Detroit 11, Michigan

MANUFACTURERS OF: FULLY AUTOMATIC GEAR GRINDING MACHINES • RZEPPA (SHEPPA) CONSTANT VELOCITY UNIVERSAL JOINTS

PLANING + MILLING

of Heavy Workpieces in one set-up . . . on one machine

- Reduces machining time
- Reduces set-up time
- Increases over-all accuracy
- Cuts manufacturing costs

Write for details

Waldrich Siegen combined planing and milling machines

WALDRICH SIEGEN

american waldrich mfg. corp.

1232 PENN AVENUE, PITTSBURGH 22, PENNSYLVANIA

There's never been one like it before!

Just a press of a button puts this mighty Schiess into action. A 25-ft. high column moves smoothly along 45-ft. long bedways. Never a vibration—no chatter—even at maximum transversal loads! The new Schiess design of the spindle heads has eliminated this!

THE MILLING OPERATION. A huge tungsten-carbide cutter in a 14¼" spindle goes to work on the stock. And performs its operation with a consistent accuracy—a surface-finish count—never before obtainable on such a big fellow.

THE BORING OPERATION. Another press of a button! Another spindle goes to work—bores a 79" depth in one cut—or a total depth of 118". Boring and milling spindles are provided with 36 speeds of which the top 12 are V-belt transmitted. Rapid traverse, feeds and manual controls of the two spindles are completely independent.

That this mighty machine has tremendous productive capacity is self-evident. And its productivity goes far beyond conventional milling and boring. Schiess attachments increase its scope to taper-milling, thread-cutting, copying and, in certain instances, copying in 3 dimensions. It's a time saver, too. Can go from feed to rapid traverse immediately, without complicated adjustments.

The Schiess Model FB 36/22.5 Horizontal Milling and Boring Machine is a product of Europe's largest builder of heavy machine tools. Parts and service are as close as Pittsburgh. An American Schiess Engineer will be happy to help you size up these heavy producers for your heavy production needs. Write for catalogs and complete specifications on all five FB models.

also bores and turns

Face milling entire side of 38' x 14' press frame on Schiess Model FB 36/22.5

engineering division

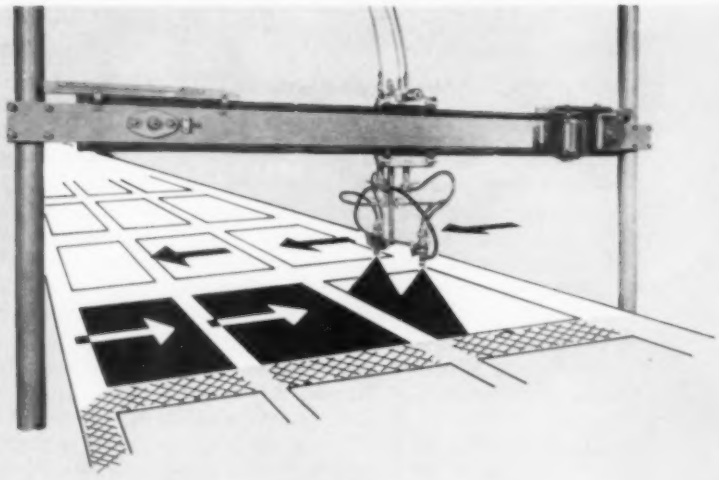
SCHIESS

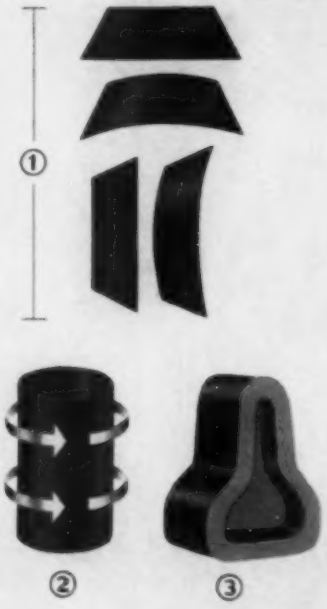
AMERICAN SCHIESS CORPORATION

1232 Penn Avenue, Pittsburgh 22, Pa.

DeVilbiss Automatics...

a cost-saving answer to coating problems





DeVilbiss Automatic Spray Machines, in three basic types, feature speed of application and uniformity of finish not possible by any other coating method. (1) Automatic Transverse Machines coat flat or contoured shapes on horizontal or overhead conveyors. (2) Automatic Rotary Machines spray all types of small shapes with ultra-fast drying material. (3) Automatic Chain-On-Edge Machines spray all types of irregular shapes inside and out.

You can increase rate of production, improve quality of your work, and reduce costs to fraction of manual methods!

DEVILBISS NEWCOMB-DETROIT

Complete mechanization with DeVilbiss Automatics eliminates variation of manual operation and boosts production—in many cases 500% or more.

Gun positions are precisely set to coat your product quickly, uniformly, with accurate lapping and minimum overspray.

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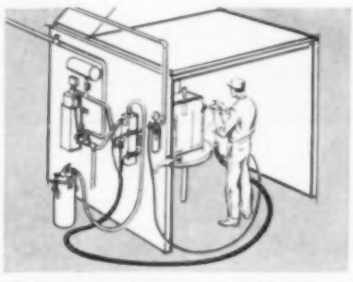

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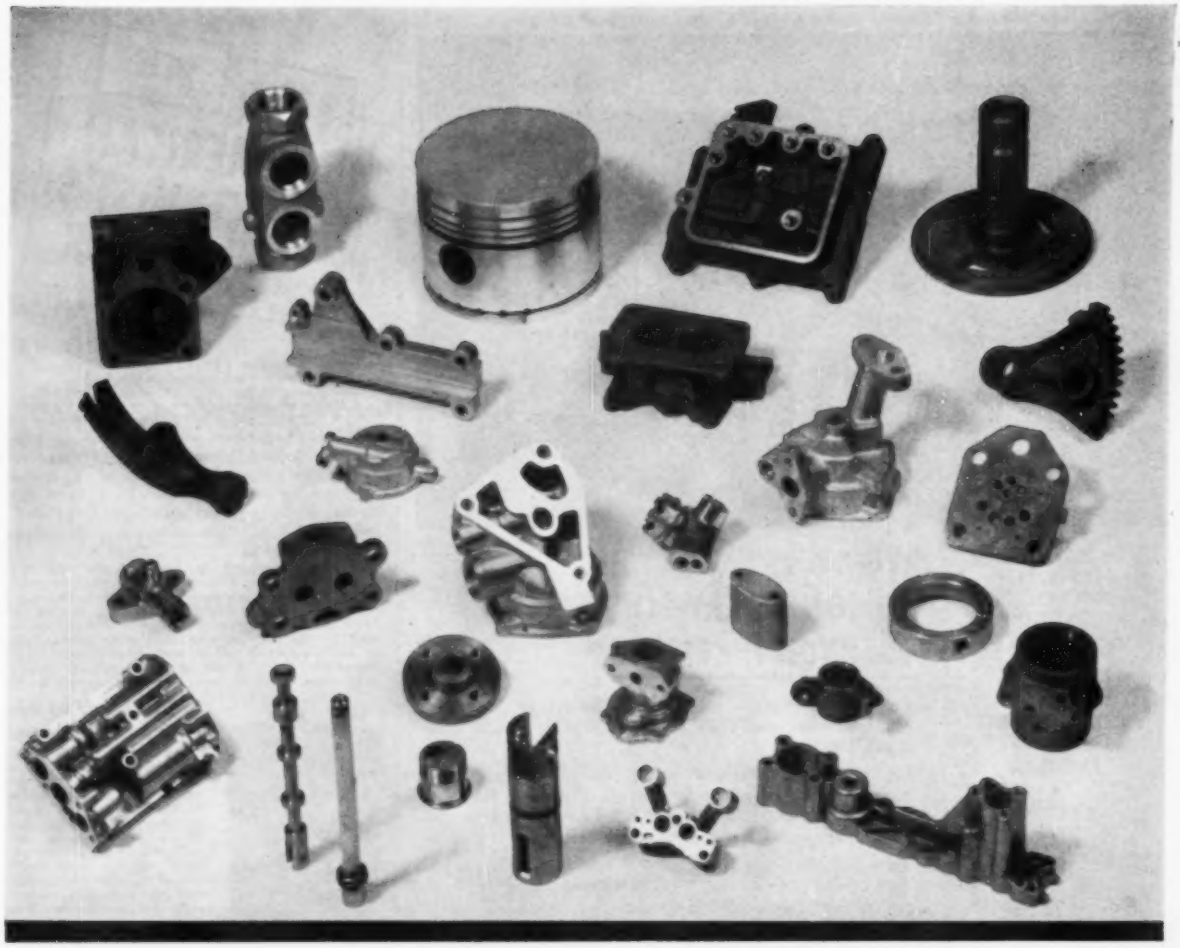

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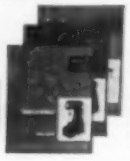

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edited by Fred H. Colvin and Frank A. Stanley
1579 pp. 5½ x 8, 774 illus., $11.00

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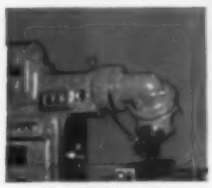

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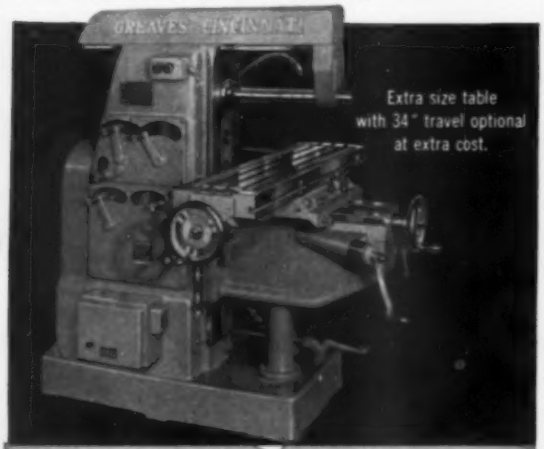

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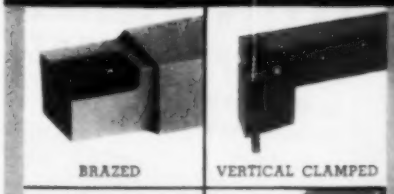
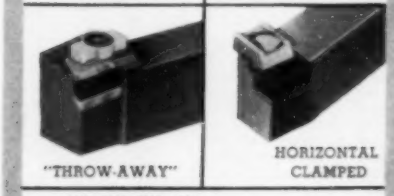
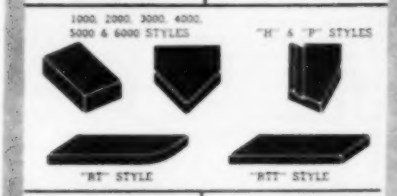
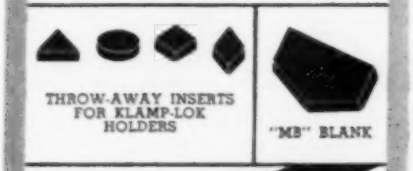
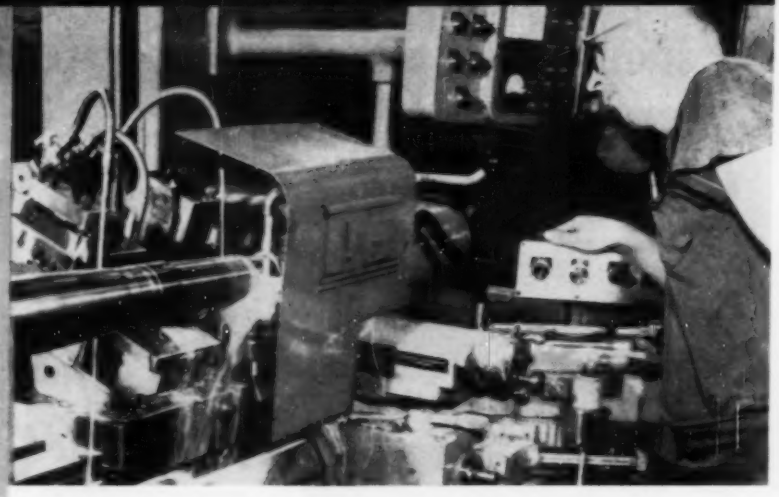
Caterpillar REG. U.S. PAT. OFF. Tractor Co. gets results . . . with Talide S-92











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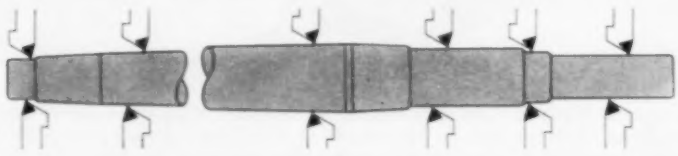

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Part . . . . . Crawler Tractor Axle Shaft

Material . . . . . SAE 8645 Steel Forging 3¼" dia. x 38½" long. 3.6mm Brinell Hardness.

Operation . . . . Rough turn all diameters, form tapers, shoulders, and steps.

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Feed . . . . . 6" per min.—.018 F.P.R.

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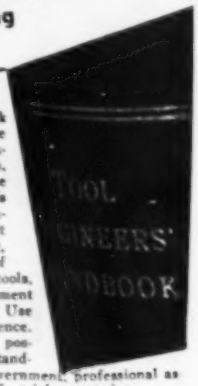
An outstanding reference on PLANNING, CONTROL DESIGN, TOOLING and OPERATIONS in the mechanical manufacturing industries



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TOOL ENGINEERS' HANDBOOK

American Society of Tool Engineers
Frank W. Wilson, Editor-in-Chief

Written by 144 authorities in the field, this massive reference, consisting of 115 big sections covering tool engineering from A to Z, has been checked and double checked from cover to cover to insure accuracy. Here are the complete, authoritative answers to your problems, brought to you in compact, easy-to-find form.

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- Includes all new techniques and processes of recognized acceptance including Powder Metallurgy, Investment Casting, Plastic Joining of Materials, etc.
- Conventional tables of feeds, speeds and cuts modernized to bring them into line with latest cutting tool materials and cutting practices.
- Treats, process-wise, such topics as Plaster Mold Casting, Superfinishing, Rotary Swaging, Sheet and strip cold roll forming, Die Hobbing, etc.
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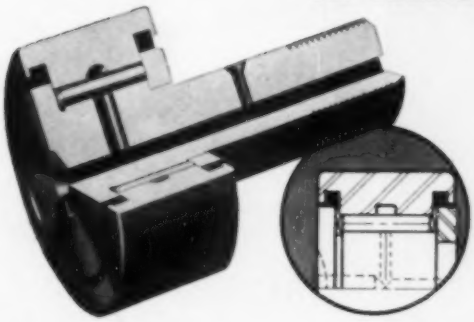
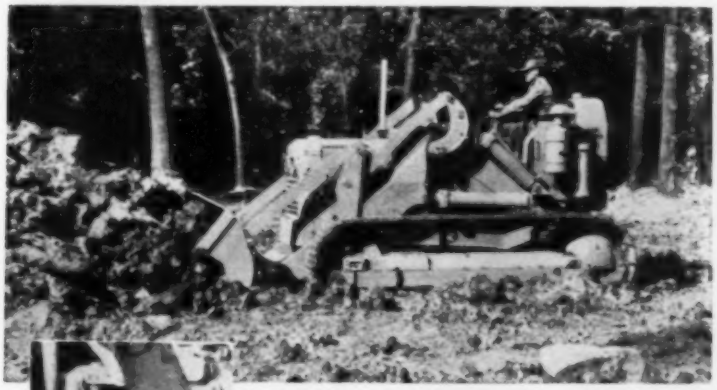


Now Sealed and Prelubricated

The new SCF series of the famous CAMROL cam follower completely seals out dirt, chips, moisture, etc. — an important advantage where the life of an ordinarily open mounted cam follower can be materially increased with adequate protection against contamination. Also the sealed bearing is pre-lubricated with provision made for easy re-lubrication, if desired, through either end of the stud.

Specially treated synthetic seals are contained in the outer race undercuts over the stud flange and roller retaining washer. For added protection, all external surfaces of the bearing are treated to provide a corrosion resistant, black ferrous oxide surface.

These same advantages are available in the SCYR sealed series Cam Yoke Roller (without stud). Specify CAMROL bearings with the built-in seals that preserve cam follower dependability in critical cam action, support or track roller application.



Built-in seals protect and preserve CAMROL® bearings from contamination in CATERPILLAR-built Traxcavators®

McGill SCF series sealed CAMROL bearings provide the cam action that positions the bucket of the 977 Traxcavator unit at the selected digging angle. Mounted on bell crank arms that are actuated by contact with a cam shoe on a hydraulic cylinder linkage, these bearings are operating in the open and exposed constantly to dust, dirt and moisture. External surfaces have a black ferrous-oxide finish to prevent corrosion. These sealed McGill cam followers eliminate the need for relubrication and maintenance after installation. Caterpillar uses other McGill bearings including twelve CYR series cam yoke roller bearings in the flywheel clutch.

378 sealed CAMROL® bearings guide engine blocks in INGERSOLL automatic milling machine

The sealed CAMROL bearings used in this machine, guide cylinder blocks during transfer through various milling, boring and drilling operations. The bearings, used in place of guide bars, eliminate surface scratching of the 200 to 300 pound blocks which are transferred at speeds up to 400 feet per minute. Blocks are processed at the rate of 95 per hour. Ingersoll reports freer movement, accuracy of positioning and materially longer bearing life due to the new design that seals metal chips out of the bearings.

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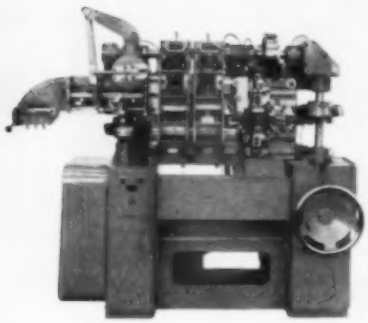

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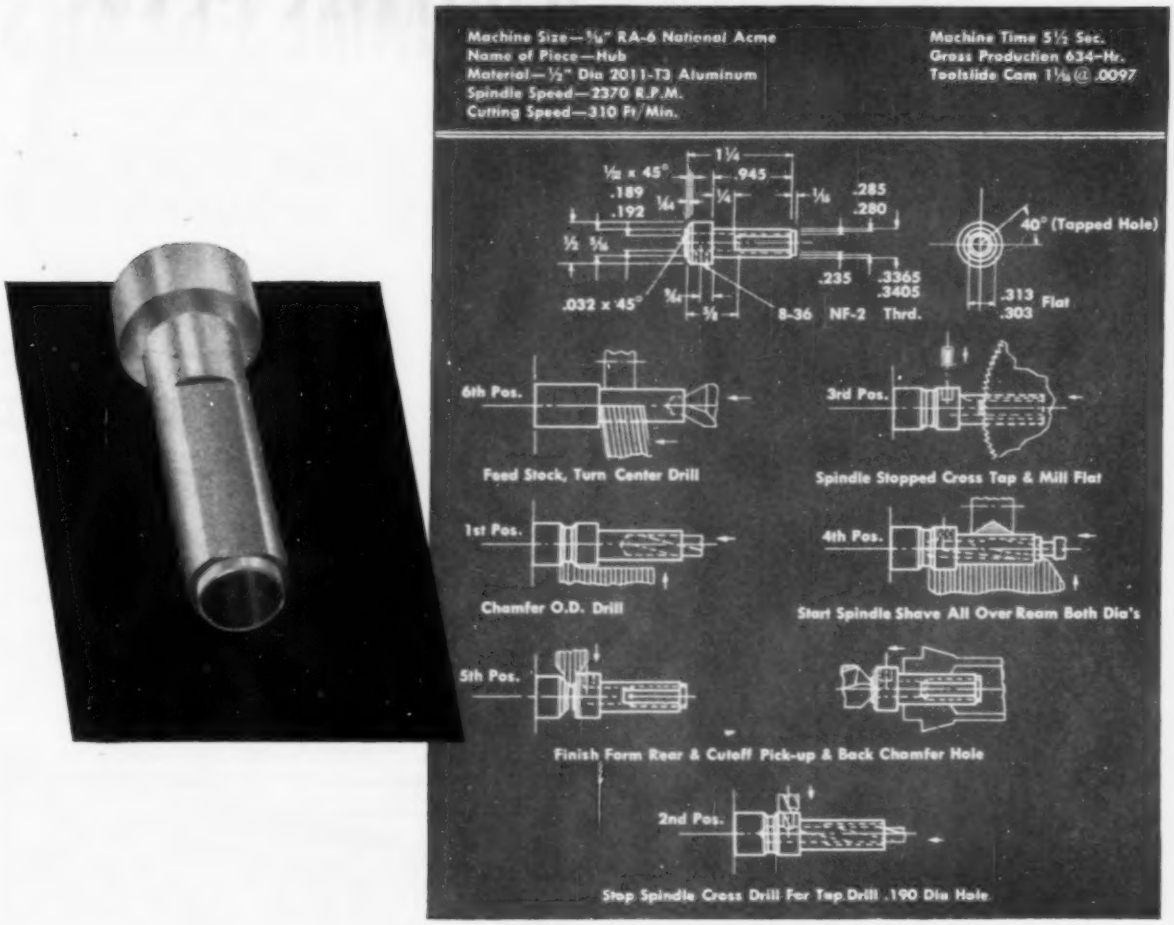

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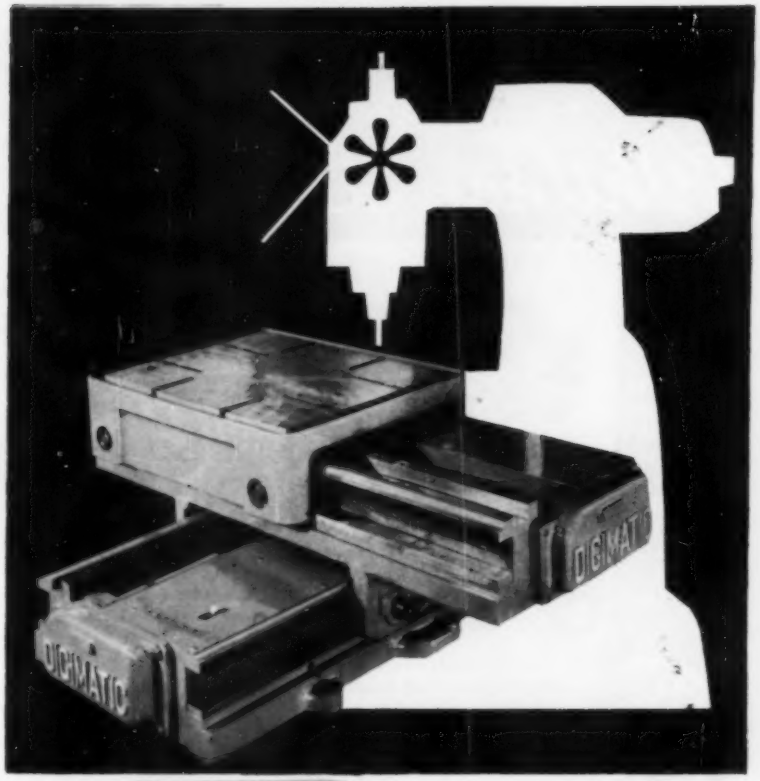

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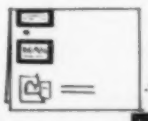

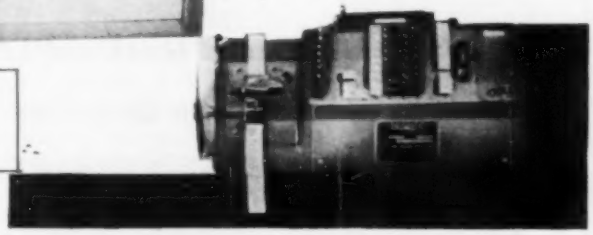

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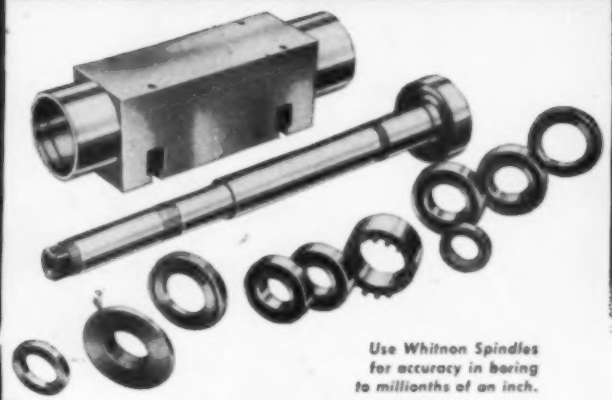

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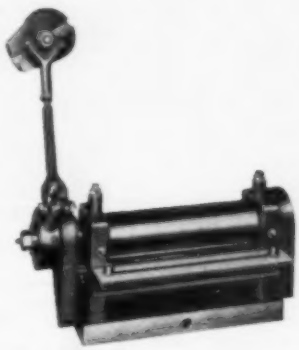

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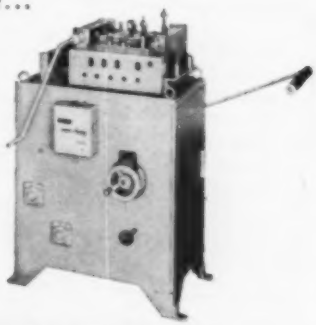

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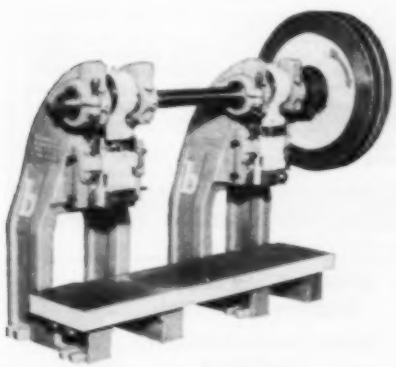

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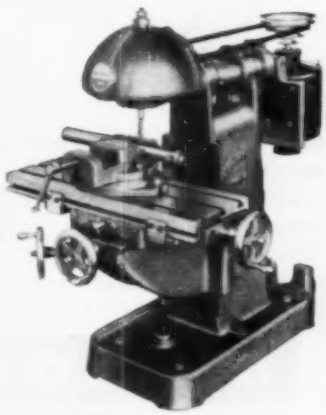

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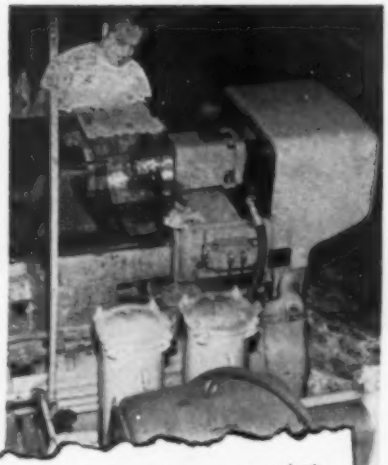

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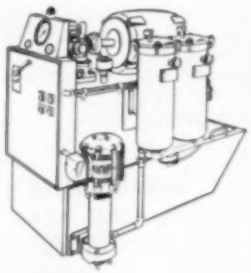

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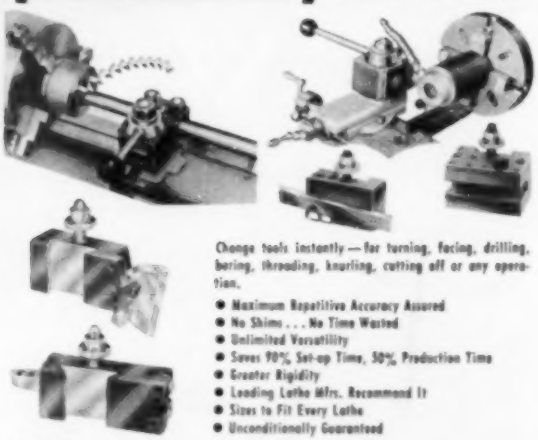

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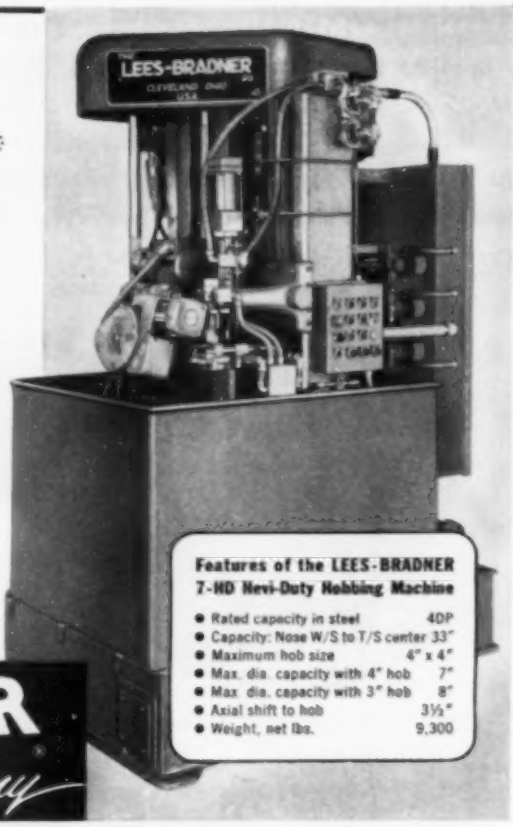

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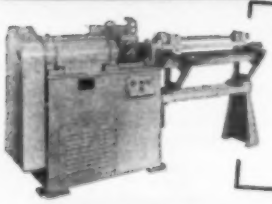

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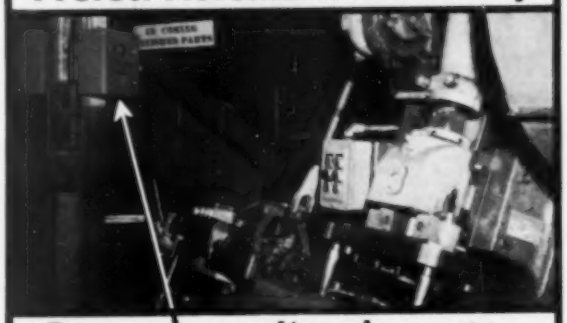

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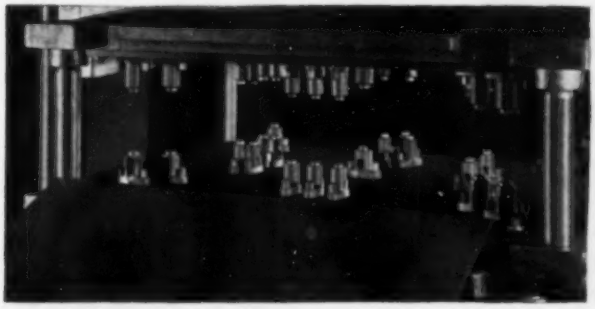

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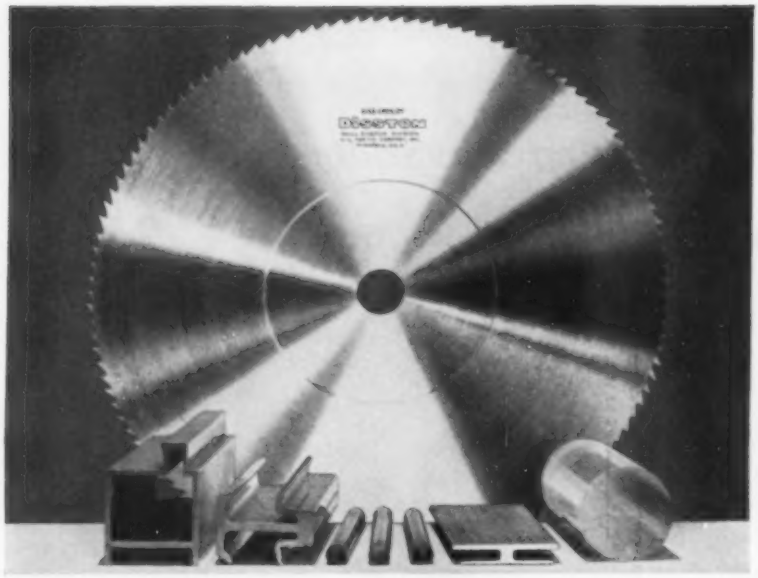

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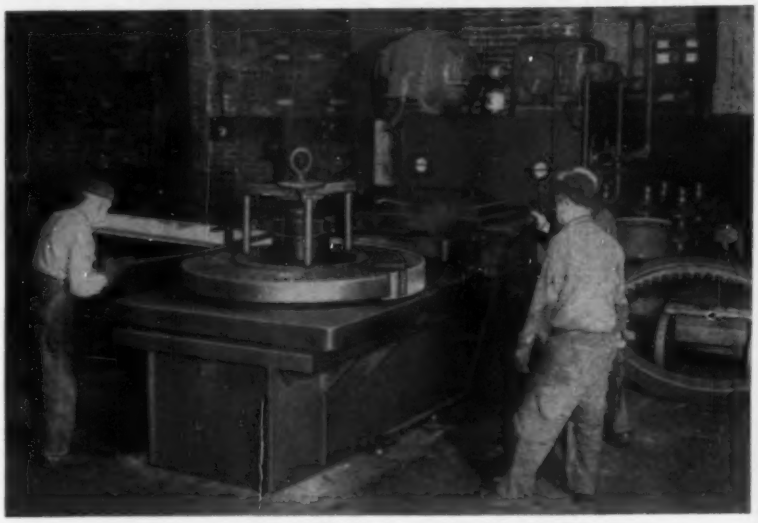

The photograph illustrates a WILLIAMS-WHITE Hydraulic Bulldozer bending angle sections into complete circles as an initial step in the production of blade circle assemblies for use on road scrapers. The completed ring with gear inserted is shown at right in photo.

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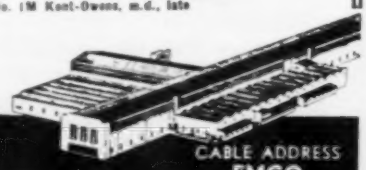

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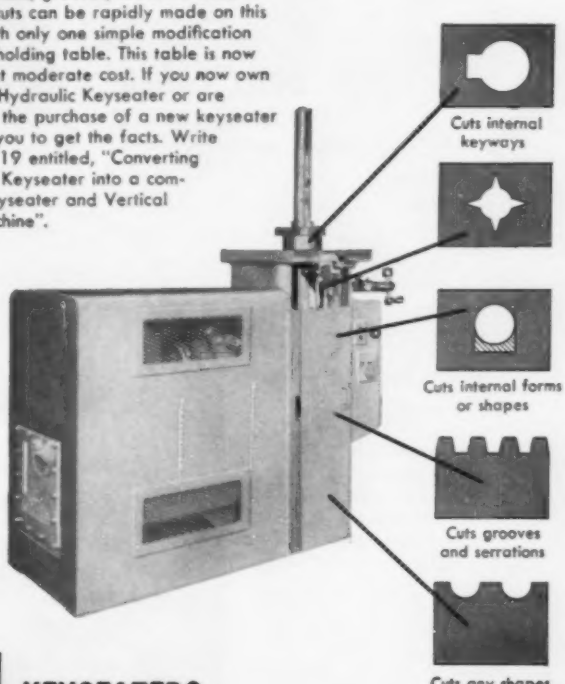

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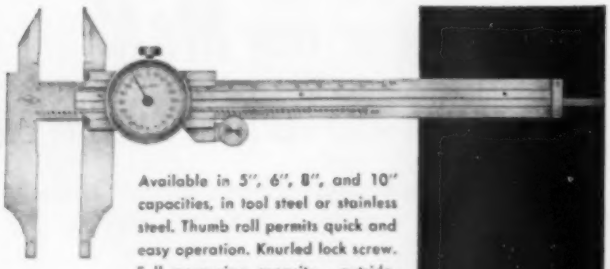

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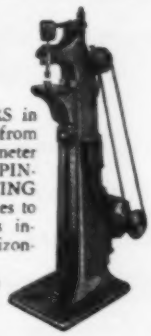

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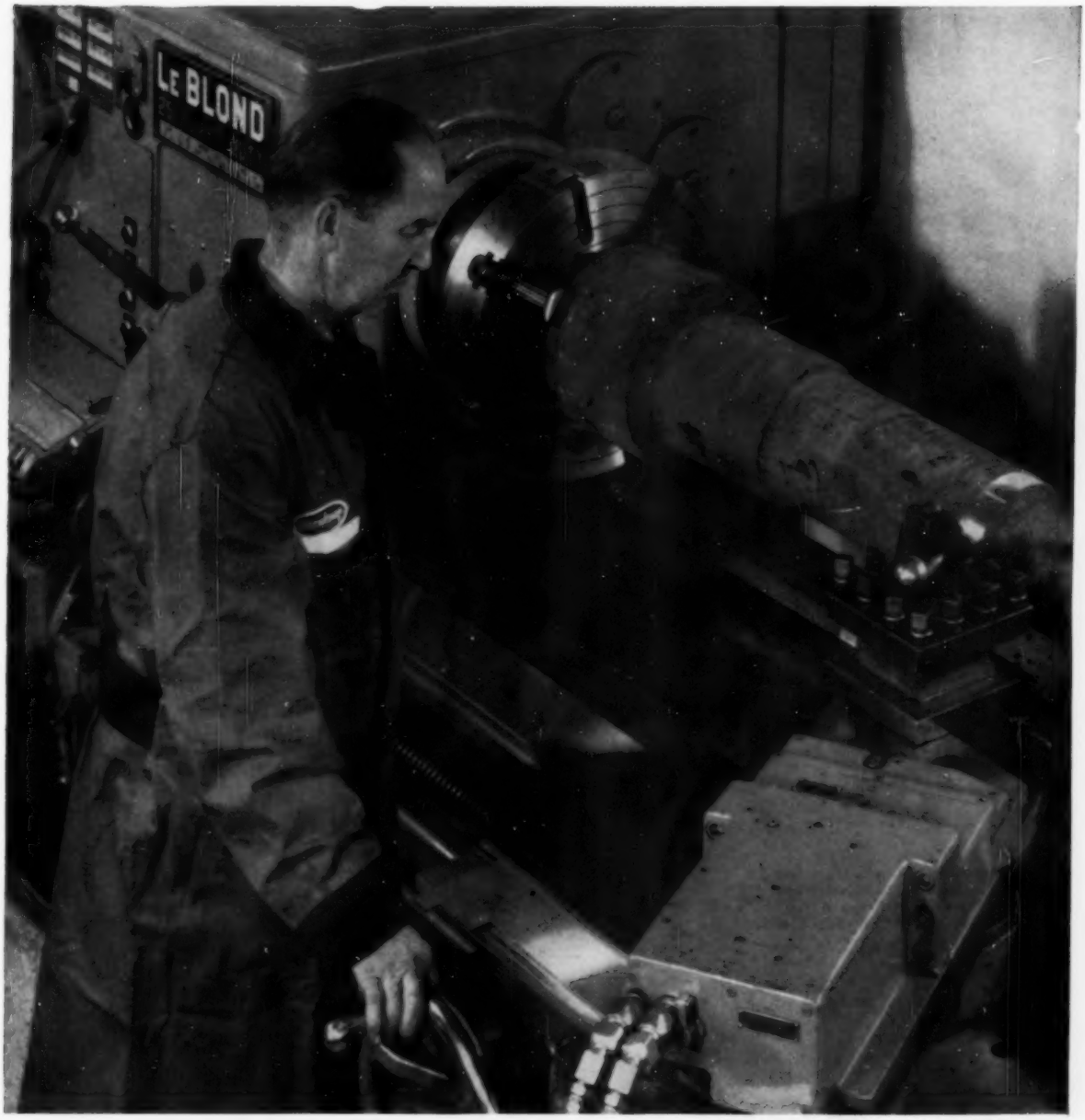

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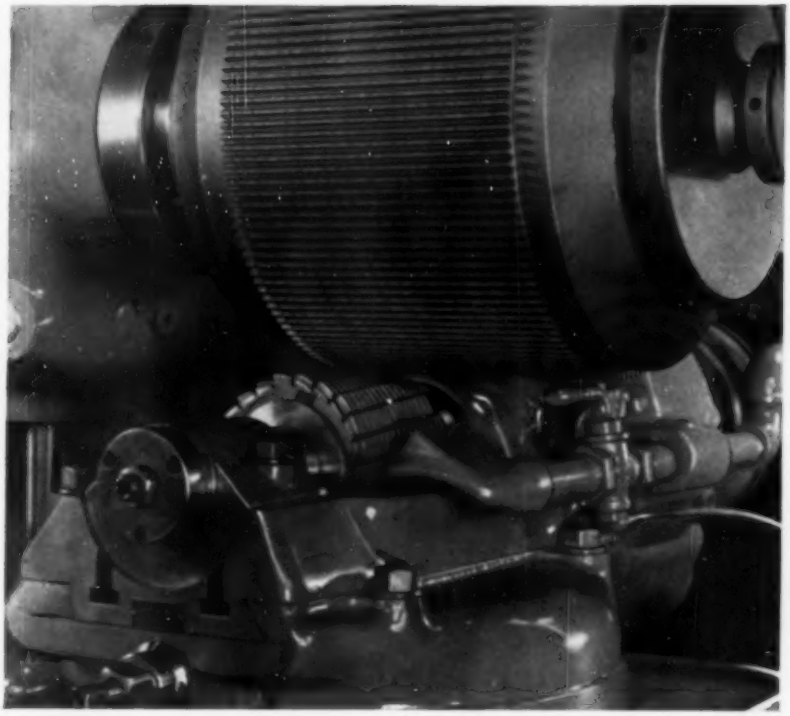
Hobs at speeds of 300 SFM —TIMKEN® bearings shrug off heavy loads



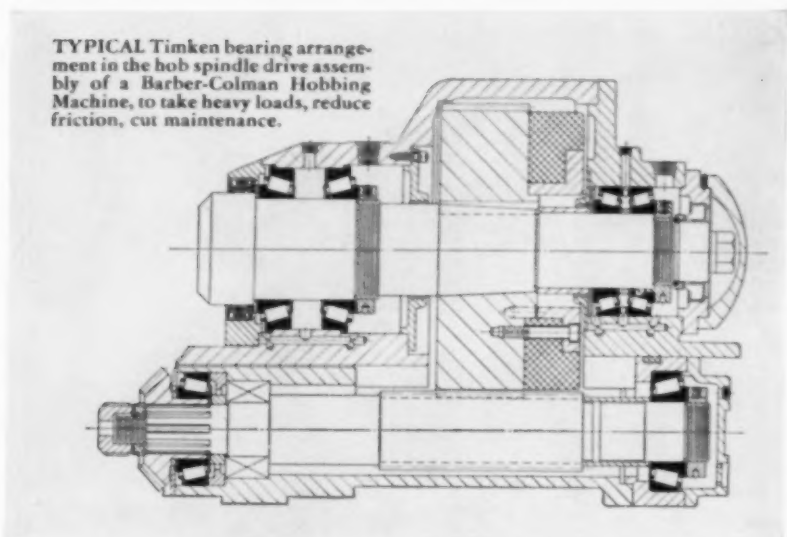
TO take the heavy loads and minimize friction when hobbing steel gears at high speeds—up to 300 SFM—Barber-Colman uses Timken® tapered roller bearings at vital points in its No. 14-15 Hydraulic Hobbing Machine. The high speed hob slide has a hob spindle mounted in Timken bearings. They're also used in the hob drive and for the top bearing on the index worm shaft. Result—gear production is faster, more accurate. Tool life is increased.

SHRUG OFF HEAVY LOADS. Timken bearing rollers and races are case-carburized to have a hard, wear-resistant surface over a tough, shock-resistant core. They take heavy loads with no trouble at all.

KEEP SPINDLE RIGID. Timken bearings hold the spindle in positive alignment. Their tapered design lets them take *both* radial and thrust loads in any combination. And they have extra load-carrying capacity because of full line contact between rollers and races.

PRACTICALLY ELIMINATE FRICTION. Geometrically designed to roll true, Timken bearings are precision-made to live up to their design. They run longer, smoother, cooler.

And for extra quality control, we even make our own electric furnace fine alloy steel. No other American bearing maker does. To get your No. 1 bearing value, always get bearings carrying the trade-mark "TIMKEN". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".



TYPICAL Timken bearing arrangement in the hob spindle drive assembly of a Barber-Colman Hobbing Machine, to take heavy loads, reduce friction, cut maintenance.

This symbol on a product means its bearings are the best.

TIMKEN *TAPERED ROLLER BEARINGS ROLL THE LOAD*

TRADE-MARK REG. U. S. PAT. OFF.